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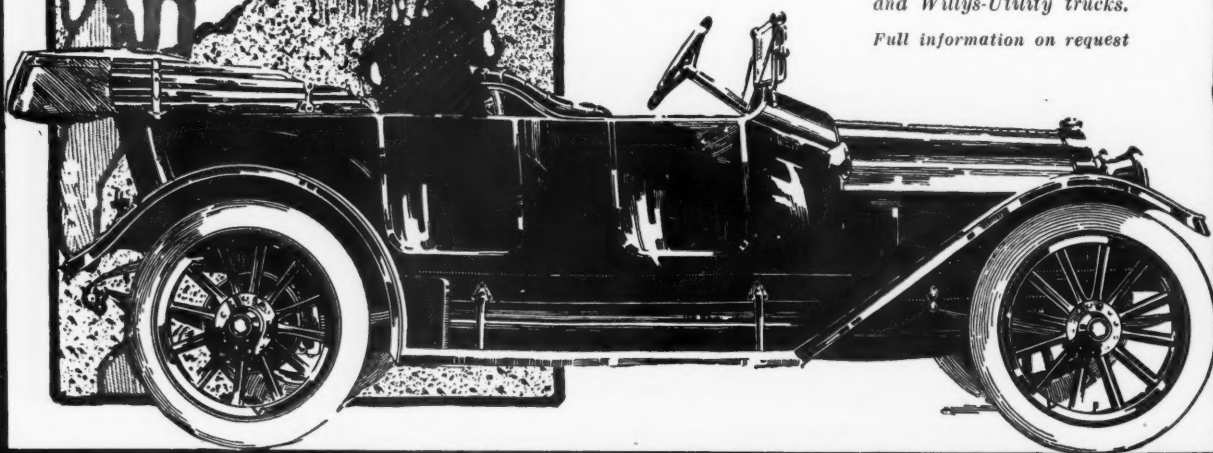
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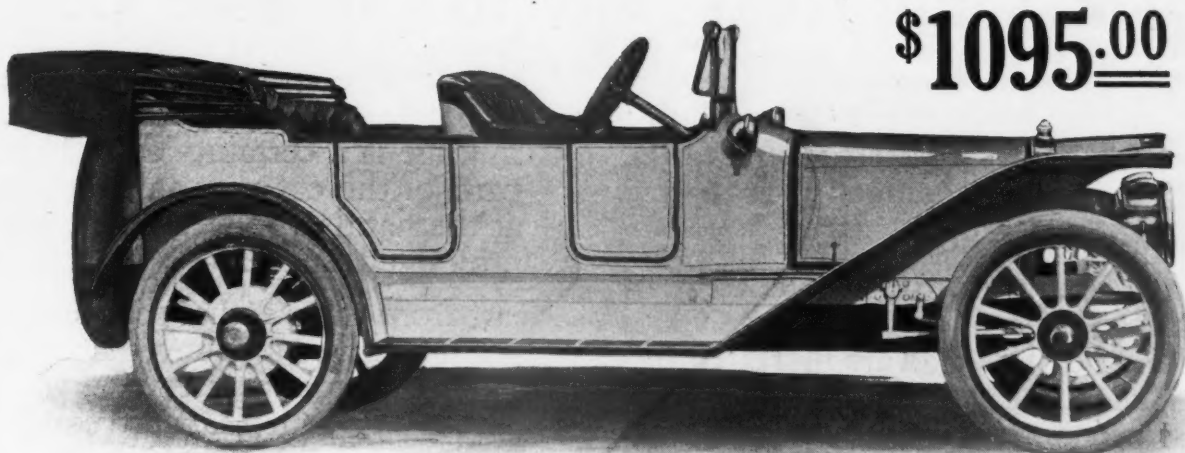
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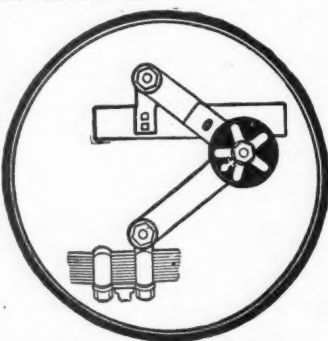
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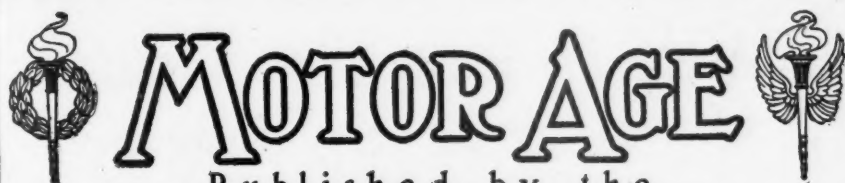
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MOTOR AGE



PRESIDENT POINCARÉ OF FRANCE ATTENDS OPENING OF SALON

By W. F. Bradley

PARIS, Oct. 20—European motors, as shown at the Paris salon, indicate a further decrease in size. In this issue the bore and stroke of practically all motors is given, in comparison with the dimensions of a year ago. This should not be interpreted too literally, however, for it frequently happens that big models figure on the makers' catalogs but are only made in infinitely small numbers.

With a full knowledge of all circumstances, we should fix the average Euro-

pean motor size at 3.1 by 5.5 inches bore and stroke. The number of cars fitted with motors of 4-inch bore is small, and the number with a cylinder bore exceeding 4 inches is infinitely small. With a cylinder area of 3-liters—183 cubic inches—it is considered possible to get all the power that can be required for touring purposes or for town work with heavy bodies. The effect of racing can be seen strongly here.

There has been this year a very strong

EXTERIOR VIEW OF PARIS SALON ON OPENING DAY

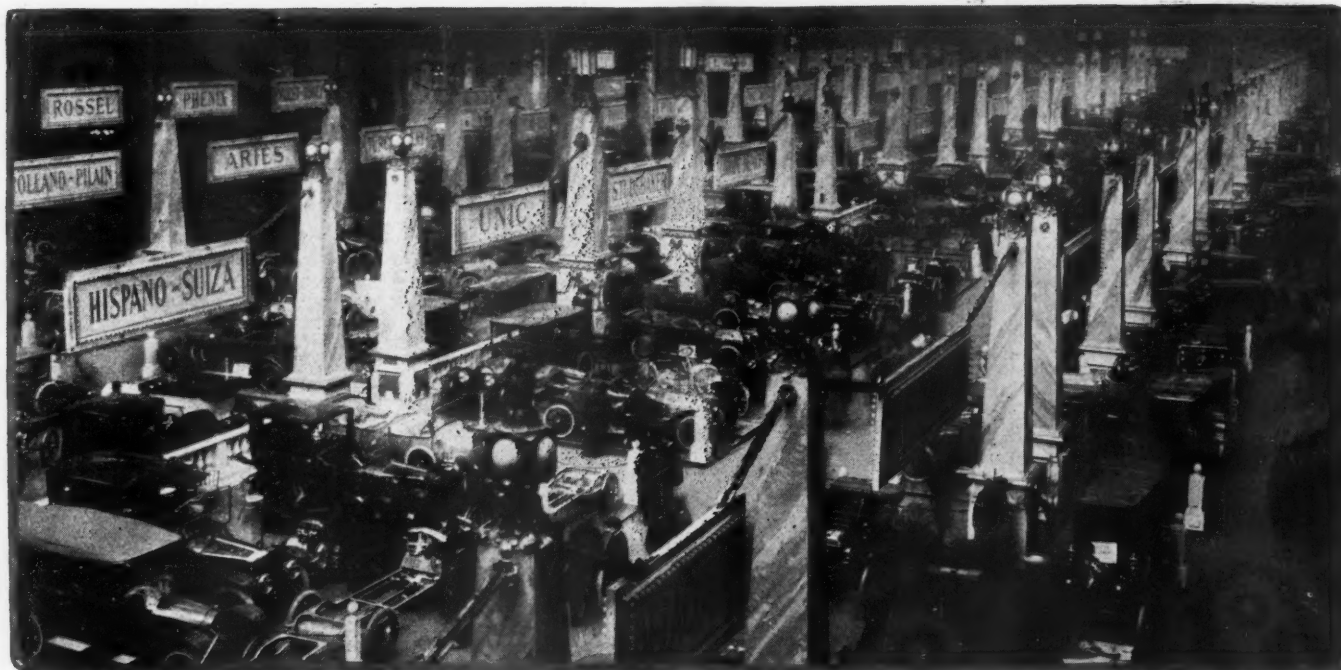
Smaller Motors Rule in Paris

*Foreign Tendencies as Noted
at French Show*

movement towards small motors on light cars which generally must be considered of the runabout type. These really are a link between the rudimentary cyclecar and the full touring car. The cyclecar really is responsible for their birth. The public has seen what it is possible to do with really small motors on a very simple type of chassis and has asked for something built on car lines and having all the appearance of a car, but possessing the low cost of upkeep of a cyclecar. This really is a substantial movement. It has been entered into by such firms as Charon, Chenard-Walcker, Buchet, F. N., Majola, Barré and Gregoire, the cylinder dimensions varying from 2.3 by 4.3 to 2.4 by 5.1 inches.

L-Type Block Castings Popular

The L-type monoblock cylinder casting is in a very big majority. It is followed by the T-type. Tendency is more and more towards block casting with an integral intake manifold, the carbureter being on the right hand side bolted direct to the



GENERAL VIEW OF PARIS SHOW ON THE OPENING DAY

group, and a separate exhaust manifold. This applies to motors as high as $4\frac{1}{2}$ inches bore. The integral exhaust manifold is found in a number of cases, but although it gives a very neat-looking motor, most designers are of the opinion that they can make better use of their cooling water than carrying it round the exhaust pipe. Hotchkiss, Renault, Charron and Unic may be mentioned as four leading firms adopting this general method of integral intake and separate exhaust manifold.

Invisible Water Pipe

With a view to neat motor appearance, Charron has adopted the plan of placing the intake water pipe directly behind the cylinder casting, instead of along one side, as is usual. This of course is with a motor having the radiator back of the motor. In this position the pipe practically is invisible. The plan is adopted on one of the very small models as well as on a long-stroke type of 3.3 by 5.9 inches. The only example of a detachable head appears to be on the Ajax cyclecar produced in France by Benjamin Briscoe.

In the movement towards higher efficiency, a certain number of makers have changed from the L to other types. Thus, Gregoire has produced a T type, Hispano-Suiza has changed from T to valve-in-the-head type; Martini has made a motor with valves in the head. This movement has not been followed very generally, but there are possibilities of development here.

The non-poppet valve motor is at a standstill. Accompanying this article is a table showing the non-poppet valve motors built last year and produced this year. The Knight motor retains its position, but the scores of others which came out with the craze for extreme si-

Number of Exhibits in Different Classes at Paris Salon.	
Car manufacturers.....	133
Motorcycles	41
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Tires and wheels.....	125
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Car accessories.....	68
Oils and greases.....	8
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Forgings	28
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Bicycles	62
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lence have in very many cases been pushed into the background. Darracq has entirely abandoned its rotary-valve motor in favor of poppet type; the C. L. C. single-sleeve is not on exhibition; the Dubois-Rousseau reciprocating ring type, shown by Buchet last year, has not made a reappearance; the Th. Schneider sleeve type shown a year ago and used for racing purposes has not been produced commercially. C. I. D. has been successful, a bigger model being added to the one produced 2 years ago. Unic experimented for a long time with a non-poppet valve but has decided not to put it on the market. Briefly, there is not a single non-poppet announcement of any importance this year. Making an exception of the Knight, it may be stated that the poppet is supreme.

Silent Chains Increase

Silent-chain drive for camshaft, magneto shaft, water pump, etc., is on the increase. There does not appear to be a single case of a manufacturer having used chains and returned to pinions. One of the most notable converts to chain drive is Renault, who is this year fitting it on

his new 18-horsepower model. In this case there are three chains: from crankshaft to camshaft, from crankshaft to magneto shaft, and from magneto shaft to dynamo shaft. Distances between centers are 5.1 and 5.9 inches, this latter for the dynamo.

Chapuis & Dornier, a motor specialist for the trade, has revised his whole series of motors to take chain-drive. This firm formerly used pinions with a spring mounting on the camshaft. Ballot, another maker of motors for the trade, has adopted chains in place of meshing gears. On the small Charron car use is made of a single chain on two pinions only by placing the magneto on the end of the crankshaft and cranking on the camshaft. On the larger cars built by this firm, the single chain is on three pinions with an eccentric for the magneto shaft. With a dynamo fitted, a special timing gear cover is employed, this having a supplementary shaft and pinion obtaining its drive by chain from the magneto shaft.

Different Timing Drives

There appears to be a tendency towards the use of a couple of short chains without adjustment, rather than a single chain driving three shafts with adjustment. The Darracq is an example of this, a broad chain uniting crankshaft and camshaft, and a narrower chain running from camshaft to magneto shaft on the left hand side of motor. These chains are made by the Coventry company, are non-adjustable, and the distance between centers is 5.1 inches. On the eight-cylinder de Dion-Bouton motors the chain arrangement is from crankshaft to camshaft in the same vertical plane, and from camshaft to magneto and ventilator shaft. Among the conspicuous firms adhering to meshing pinions are Hispano-Suiza, with

a spring mounting of camshaft pinions; Hotchkiss, also with a spring mounting on camshaft, Sizaire-Berwick with compressed fibre for camshaft, and Delaunay Belleville with spur pinions.

Reciprocating parts generally are lighter than a year ago. The I-section connecting rod is in a very big majority, although the tubular rod has been adopted by several firms during this season. Instances are Sizaire-Berwick, Delaunay-Belleville, Sauter-Harle. Steel pistons, although not in a majority, are fairly commonly employed. They are used by Sizaire-Berwick, Chenard & Walcker, Gregoire, Abadal, Anasagasti. Magnalium and other light metal pistons are not generally being used. Gregoire has turned out a few cars with magnalium pistons. Violet-Bogey makes all his cyclecar pistons of this metal.

There is a tendency to make wrist pins hollow and of much greater diameter than formerly. The Sizaire-Berwick and Chenard-Walcker cars are particularly good examples of this. It may be taken that three piston rings are used on 75 per cent of the French motors. The other 25 per cent comprise two double spiral rings and small motors having two ordinary rings. Some makers fit two rings on their small motors—70 millimeters and less diameter—and three rings on the larger models. Scraper rings on the base of the piston are now very little used: the same effect can be obtained by making the skirt thin. Oil grooves on the pistons are seen less than was the case a year ago.

Ball-Bearing Crankshafts Lose

Ball-bearing crankshafts have gone back rather than increased in favor. Although they have been very successful on racing cars, particularly on the Delage and Peugeot racers of the last two seasons, makers hesitate to put them into motors intended for the ordinary customer. Delage last year used a central ball bearing and two plain bearings for his six-cylinder motor, but now is employing three plain bearings. Cobron uses a central ball bearing and two plain bearings for a four-cylinder crankshaft. Aquila has the same arrangement for a six. There are a few very small motors with two ball-bearing crankshafts. On the whole the two-bearing crankshaft—plain bearings—has lost place. It is found on the new Unic of 80 by 130 millimeters, and on the Briscoe of equal dimensions, the diameter of the shaft in each case being practically 2 inches.

The vast majority of makers prefer a three-bearing shaft. There appears to be nothing to indicate that this will be displaced in the near future by the five-bearing crankshaft for four-cylinder motors. Renault, however, who has been a strong advocate of the three-bearing crankshaft, has this year produced a 3.7 by 6.29 motor cast in pairs with a five-bearing shaft.

It appears quite likely that the rival to the three-bearing shaft will be the

four-bearing shaft, rather than five bearings. There are only two examples this year: Motobloc, which is of course special by reason of its central flywheel, and Hispano-Suiza with two long end bearings and a couple of shorter bearings between the first and second and the third and fourth cylinders. Engineers have given this matter attention and in several cases would have produced four-bearing shafts this year if manufacturing arrangements had made it possible.

Sizes of Motor Shafts

Four bearings appear to embody a greater number of advantages than five, for the former can be used with a short monobloc casting having a shaft of extreme rigidity. For the medium size motors of 3.1 inches bore crankshaft diameters vary from 1.88 to 2.16 inches. Crankshafts almost invariably are carried in

Table Showing Types of Final Drive Adopted by European Car Manufacturers at Paris Salon.

Worm only, Daimler, Bellenger....	2
Worm and bevel models, Darracq, Gregoire, Peugeot, Minerva, de Dion	5
Double helical only, Mors.....	1
Double helical and chain, Gobron..	1
Double helical, worm and bevel, Minerva	1
Bevel only, All other makes.....	124

Total number of car manufacturers133

Non-Poppet Valve Motors at Paris Salon for 1913 and 1914.

Arles, Knight.....	Knight
Bellenger, Knight.....	Knight
C. I. D., Rotary ring.....	Rotary ring
C. L. C., Single sleeve.....	Withdrawn
Buchet, Reciprocating ring.....	Withdrawn
Clement-Bayard, Knight.....	Knight
Darracq, Rotary.....	Withdrawn
Delaugere-Clayette, Sleeve.....	Sleeve
Itala, Rotary ring.....	Rotary ring
Minerva, Knight.....	Knight
Mercedes, Knight.....	Knight
Mors, Knight.....	Knight
Panhard, Knight.....	Knight
Rolland-Pilain, Sleeve.....	Withdrawn
Piccard-Pictet, Argyll sleeve.....	Argyll sleeve
Schneider Th., Sleeves.....	Withdrawn

ball bearings. The only new departure appears to be the use of cast-iron bearings for the camshaft. This has been done by Darracq and by Hispano-Suiza. Both firms have tested these bearings for long periods with satisfactory results. Lower cost is the main reason for their adoption.

Block casting of motors now is general. The percentage of single castings probably is as high as 75 or 80, the remainder being big motors cast in pairs. Not a few firms carry the whole of their series in bloc castings, this including motors as high as 4 inches bore. Berliet is a good example. There practically are no single castings left, with the exception of the big Panhard-Knight motors. Sixes are more often in groups of three, as in the case of Delaunay-Belleville. Brasier and Delage cast their sixes in one block.

Thermo-syphon water circulation appears to have reached its height of development last year. Probably numbers are about equally divided, but there have been a few desertions from the thermo-syphon camp, and the new comers in the motor field more often rely on a pump than on natural flow. Darracq has taken to the pump for all models, Panhard has abandoned thermo-syphon on the few models on which it was tried; Gregoire has preferred to add a pump on its new high-efficiency types; Bayard-Clement uses a pump on the latest car. The leaders in the thermo-syphon camp—Renault, Charran, Delage, and others, have not made any change. The pronounced tendency is towards pointed radiators.

Pointed Radiators Gain

While makers have primarily been led to this by a desire for a better streamline effect, they have also the advantage of obtaining an increased radiating surface. Makers using this type of radiator for the first time are Hispano-Suiza, Abadal,



MAIN AISLE OF THE PARIS SHOW



- 1, Studebaker;
- 2, Cadillac;
- 3, Where Hudson is located;
- 4, Ford;
- 5, Packard;
- 6, Hupmobile

EXHIBITS OF SEVERAL AMERICAN CAR MANUFACTURERS

Panhard, Bellenger, Gobron, Unic, Mercedes, Sizaire-Naulin, Vauxhall.

Worm drive is not a particularly prominent feature on the new models. It is being adopted on all the Bellengers, on about 70 per cent of the Darracq production, and other continental firms using it for one or more of their models, but not for the entire output, are Gregoire, Peugeot, Brasier, Minerva, etc.

Much Attention to Brakes

Few parts have received such attention as brakes. Practically all manufacturers have realized that their models left something to be desired in this respect, for there hardly is a firm which has not carried out improvements. Some of the latest brake drums are enormous. On the

Sizaire-Berwick the drums measure 13.4 by 1.65 inches. These drums are machined all over, have deep fins, and the aluminum shoes are lined with Ferodo. The brake drum on the rear of the gearbox is skeleton, with aluminum fins bolted on it to assist in drawing air from under the bonnet.

On the Charron 12-horsepower car, with a motor of a little more than 3 inches bore, the brakes are side by side on the rear wheels, with drums measuring 16 by 3.7 inches. Gobron has three sets of brakes, one on the rear of the gear box, and two sets side by side on the rear wheel drums. The differential brake has the peculiarity of having its shaft supported at both ends. There is a double

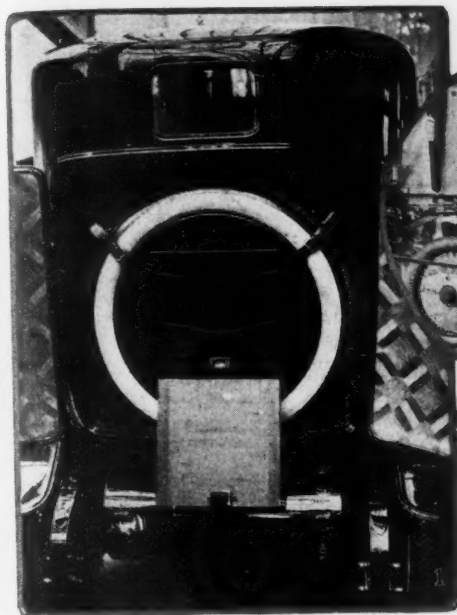
ball bearing on the front of the shaft and in a bracket to the rear of the drum another ball bearing. Turcat-Mery has a differential brake, internal expanding ribbed drum type, measuring 14 inches by 3.7 inches.

The rear wheel brakes on the other hand are comparatively small. Since last year, when there was a decided tendency towards double brakes on the rear wheels, this system has not made very much progress. It has been adopted by Bayard-Clement on their latest touring model, by Barrée on a light car, and is retained by Panhard, Gregoire, D. F. P. La Buire retains its brake on an extension of the drive shaft, back of the axle.

Front-Wheel Brakes Unpopular

Front wheel brakes have not found popularity. They are only to be found on one model, Isotta-Fraschini. About 50 per cent of the continental makers have internal brakes with ribbed drums at the rear and either the same on the gearbox or external brakes with ribbed shoes.

Brake adjustment also has received a considerable amount of attention. Numerous ingenious devices have been brought forth to adjust brakes without the use of tools. One very good method is that used on the Sizaire-Berwick, the



1—Cabinet for spare tire on Berliet limousine
2—Boat body by Rothschild as fitted to a Gobron

- 3—The Mercedes boat body
4—Daimler D-fronted limousine
5—Turcat-Mery touring car
6—Fiat landaulet

two ends of the cables being carried into blocks sliding freely in a cross tube and these blocks united by a spindle have a left and right-hand thread with a control brought through the side frame so that it is possible to bring the blocks closer together and thus shorten the cable. This arrangement also acts as equalizer.

Six Cylinders Wane

The six-cylinder motor is hard to find in the Paris salon. With the exception of Delaunay-Belleville who has increased his number of sixes and now is producing more of this type than of fours, the continental makers have almost abandoned the six. Rolls-Royce is showing but one model with a six-cylinder motor. Daimler has a couple of sixes, Packard and Hudson show sixes only, and all the others are specializing on fours. Excluding these English and American firms, there are only twelve manufacturers producing six-cylinder motors. Several of these are not even taking the trouble to show them and produce them in such small quantities that they really may be ignored. The six-cylinder motor never has been very popular on the continent, and it must be admitted that it has lost ground during the past 12 months. The objections that are brought against it on the part of the owner are high fuel cost, excessive overall length and periodic vibration. There also is the feeling that the six never has proved itself the equal of the four on the score of efficiency as judged by racing.

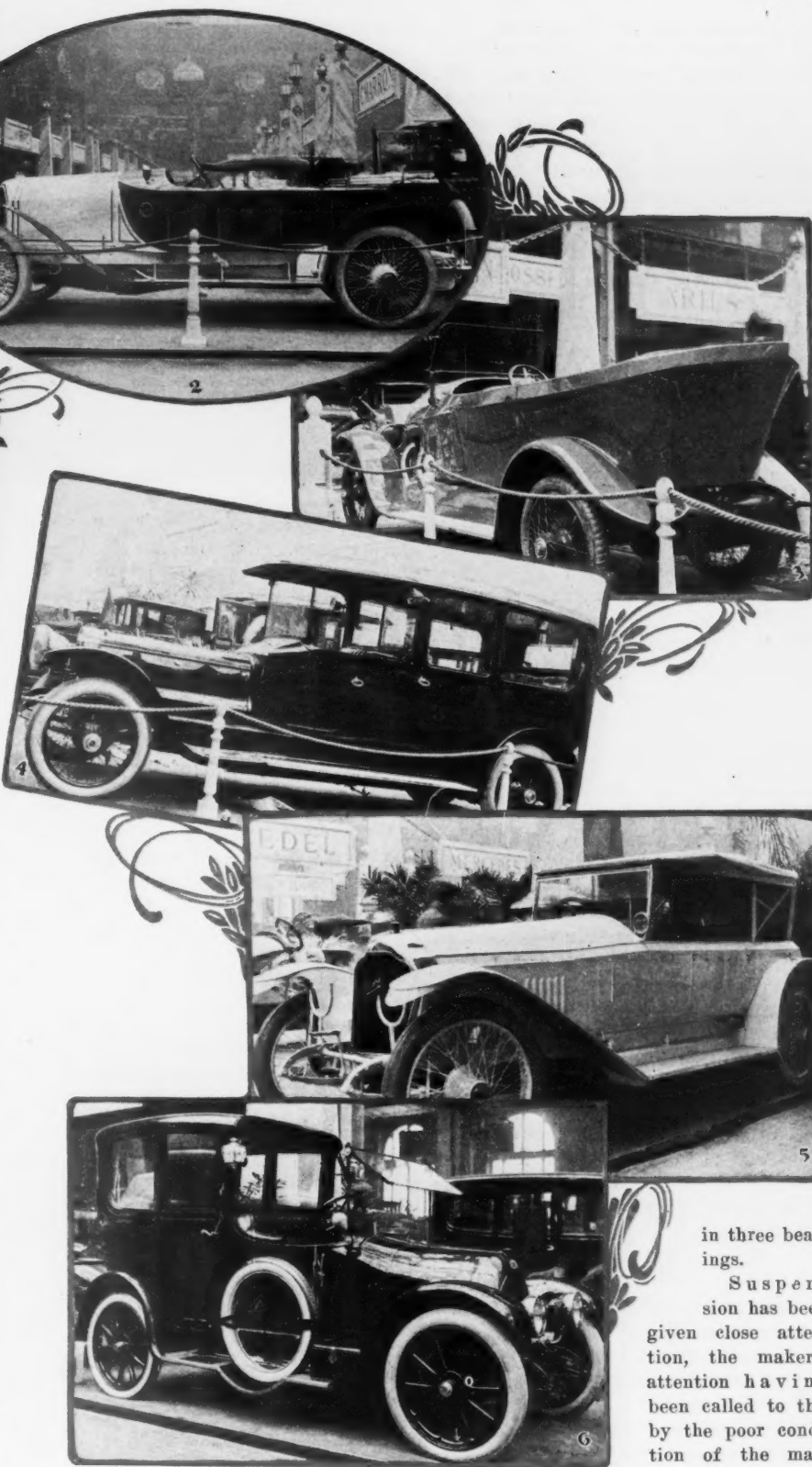
Delaunay-Belleville, who undoubtedly is the leading maker of sixes on the continent, announces this type exclusively for 1914-1915. There are two four-cylinder types on the catalog, and probably they

will be continued for a little while, then dropped. For the new models the stroke has been lengthened. The 78 by 140 is a new type; the 85 by 130 will be replaced by 88 by 150, and the 100 by 140 is being increased to 103 by 160 millimeters. All the motors have cylinders cast in two groups of three. Delage has specialized in a small six, bore and stroke being 65 by 130 millimeters. This a monoblock casting with valves one side, and thermosiphon cooling. The crankshaft is carried

faster average speeds, and the greater desire for comfort.

Semi-Elliptics Popular

The platform type of spring practically has gone out of use, the only firm of importance still using it being Delaunay-Belleville. There is not an elliptic spring to be found in the show. Three-quarter elliptic springs have decreased in number and semi-elliptics have increased. It may be taken that the semi-elliptic is the most popular type at the present time. The



in three bearings.

Suspension has been given close attention, the makers' attention having been called to this by the poor condition of the main road surfaces, the

great majority of the cars shown this year have longer and broader springs with thinner leaves. Sizaire-Berwick, on a medium five-passenger car has rear springs 2.7 inches in width by 57 inches in length. The leaves are very thin and vary in number from fifteen to twenty. They are seated under the axle and directly under the frame members.

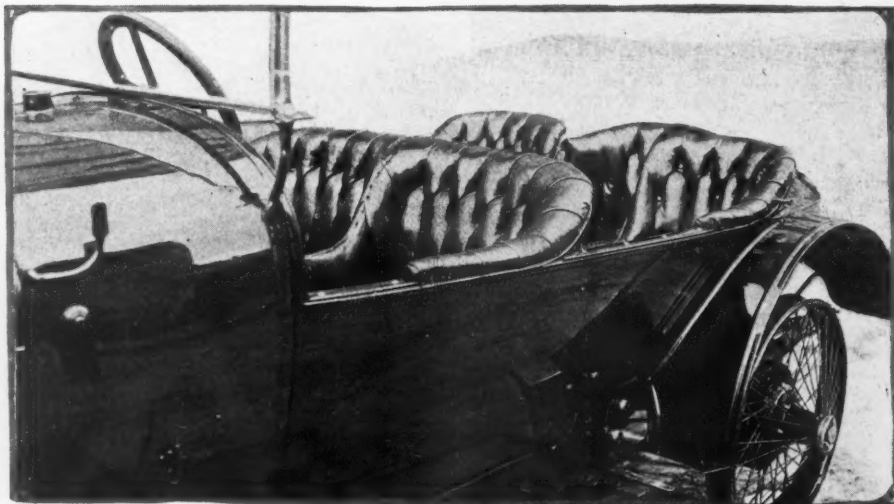
Underslung Springs

This method of carrying the springs under the frame and under the axle also is used by Charron and by S. C. A. R. Piccard-Pietet, with a car about the same weight as the Sizaire-Berwick, has springs 2.3 inches in width and 58 inches in length. On the Delaunay-Belleville models the springs are 2.5 inches wide at the rear and have fifteen leaves. Renault has particularly wide springs, 2.8 in width by 60 inches in length, semi-elliptics. This type of suspension, as adopted on the Renault, is accompanied by a kick-up over the axle and a sweep down at the rear. It has been adopted by numerous others, among them Peugeot and Darracq.

Centilever springs appear to be coming into favor. The only European firm of any importance having used them up to the present is Rolls-Royce. This year for the first time they are shown on one of the Berliet models and it is declared they will later be applied to all the cars produced by this firm. Bellenger has adopted a similar type of spring. Clement-Bayard has a double centilever spring, one of them being secured at the top and the other below the axle housing.

The objection made to three-quarter elliptic springs is that they set up side sway preventing the car holding to the road in the same manner as a semi-elliptic. Where three-quarters are employed it is becoming more common to make the upper portion shorter than formerly, to make the lower portion flat under load, to place it under the axle, and attach the upper part below the top of the frame member. The new Unic is an example of this.

There is not much to be said about ignition. A high-tension magneto is found on every European car in the show. Double ignition is as obsolete as the dodo; dual ignition with one set of plugs is found on less than 1 per cent of the cars. On the high-efficiency motors there is a tendency to fire two plugs simultaneously. Racing experience show that for big motors this is decidedly advantageous, but that the gain in power is very slight on motors of small and medium size. The principal firms adopting this plan are Hispano-Suiza for their new valves in the head motor, Gregoire for the high speed T motor, and Chenard-Waleker for an L motor. In this latter case one set of plugs is mounted in the caps over the intake valves and the other in recesses specially formed on the water outlet pipe. Although the Chenard-Waleker motors are small, their engineers claim to get an ap-

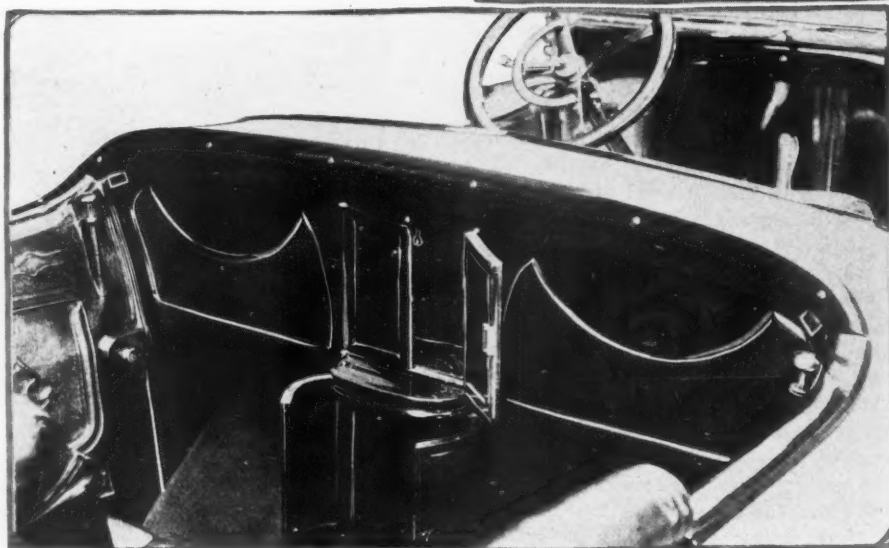
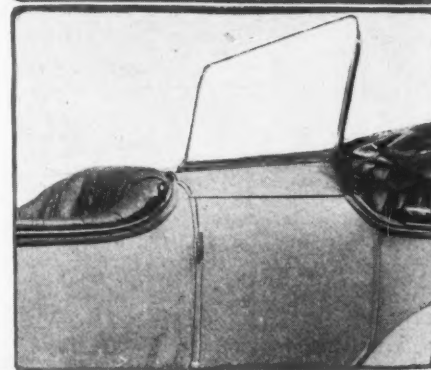
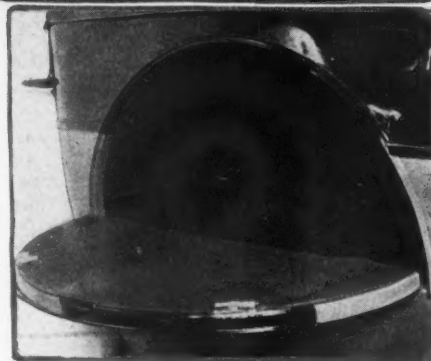


preciable increase in power by the use of double plugs.

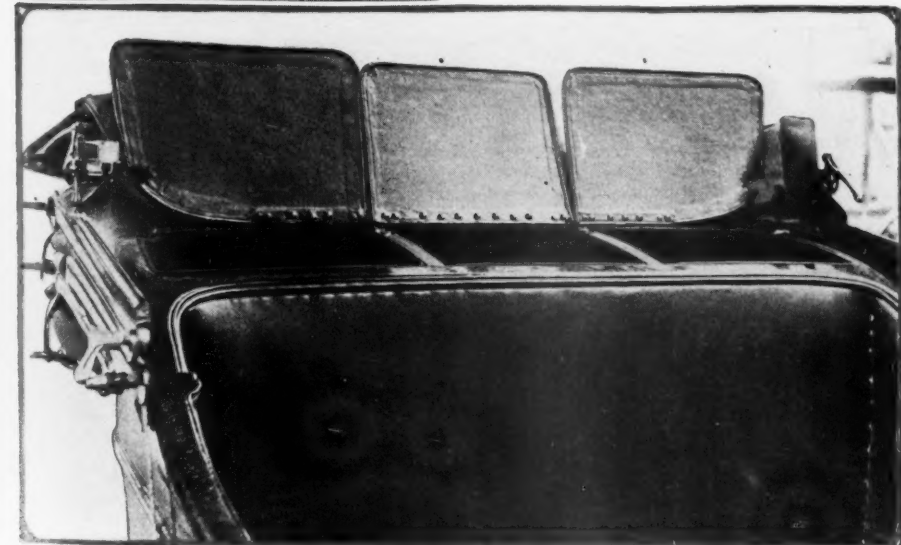
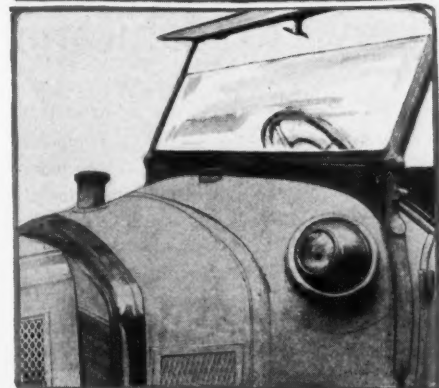
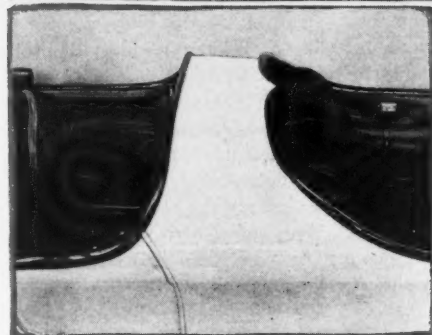
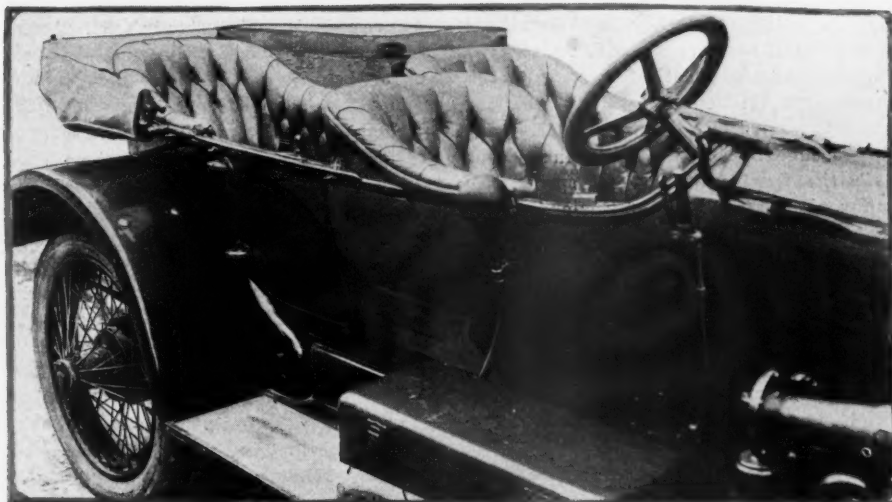
In place of fixed spark ignition which was very common on the cheaper range of cars, there is a tendency to adopt the automatic advance magnetos. Renault has made this change. Water-proof magnetos are used by Delaunay-Belleville, but have not caught on as much as might be expected; they do not appear to be used on more than 10 per cent of the cars.

Magneto Mountings

There are two general methods of mounting magnetos: on a cross shaft in front of the motor, the same shaft generally driving the water pump; and alongside the motor, the magneto being behind the timing gear housing and the water pump ahead of it. This latter method is used on the new Darracq, where the magneto has a leather coupling and the pump casing is cut away to allow any water leakages to run clear away without any possibility of getting inside the crank-chamber. On this motor there is no ad-



From top to bottom—Four-seated sporting body by Alin & Liantard. Felt-lined chest for carrying spare wheel. Alin & Liantard body with deck and screen in front of passengers. Cabinets at back of front seats on Lamplugh body



From top to bottom—Details of Alin & Liantard three-seater. Tumble-home sides and scuttle back on a Lamplugh body. Side lights in scuttle dash. Compartments on top of spare-wheel cabinet for tools and parts

justment for the packing gland of the pump, this being kept tight by an internal spring.

Unusual Magneto Locations

Delahaye is another example of the longside position; Sizaire-Berwick is another, but in this case there is no pump. The cross shaft location appears to have a slight numerical advantage over the longside position. The former is found on Fiat, Diatto, Piccard-Pietet, Bellenger, La Buire, Peugeot, etc.; also on Turcat-Mery, Bollée and Berliet, although these cars have no pump. The Hispano-Suiza is a good example of a cross shaft, for in this case it is driven by helical gears from the front vertical shaft, and is somewhat higher in position than usual.

Renault has changed the position of his magneto to alongside, in order to be able to place the electric lighting dynamo right in front. An unusual position is the driving of the magneto off the front end of the crankshaft, as done on the small Charron. The starting handle has then to be put on

the camshaft. It is a simple arrangement and quite satisfactory for small cars with the radiator on the dashboard. S. P. A. has a cross shaft for the magneto and the water pump inside the front end of the cylinder casting. The pump shaft receives the two-blade fan, thus abolishing the use of a belt. Another mechanically-driven fan is the Hispano-Suiza, fitted with a friction device and a clutch.

Magneto accessibility has been developed to extreme limits on the new Bayard-Clement. This motor has radiator on the dashboard. The timing gears are chain-driven, and the magneto is set out ahead of the timing gear housing and above the level of the frame. By its side is the electric lighting dynamo driven by an inclosed chain from the magneto shaft. The carbureter also is brought out in front, just to the right of the dynamo and several inches ahead of the front cylinder. The three organs—magneto, dynamo and carbureter—are thus in a line and close to hand when the bonnet is lifted. This location of the carbureter makes it necessary to have an exceptionally long straight intake pipe running front of the cylinder casting and having two branches to the intake ports.

Intake Part of Casting

The general tendency is to incorporate the intake manifold with the cylinder casting. This is the natural outcome of the L type of motor, for it allows the carbureter to be placed alone on the right hand side of the motor, with the carbureter bolted up direct to the casting. This leaves the valve stems perfectly accessible. Renault has adopted this system on his new 18-horsepower car, thus freeing the valve side of all piping; it is also used on all the Hotchkiss cars and on the latest type Darracq. This arrangement abolishes all visible hot air pipes, for if it is required to warm the primary air it can be done very easily by passing a pipe between the base of the second and third cylinders into the valve stem chamber. This is done on the Darracq with certain types of carbureters.

Makers appear to prefer to use stock carbureters. The most popular are Zenith and Claudel. A few English carbureters, among them S. U. and Smith, have got on the French market recently.

The slide towards electric lighting is a most notable feature of this year's show. For some time the public has been willing to accept electric lighting, but makers have not shown any enthusiasm in forcing it on them. Recently a company has been formed under the title S. E. V.—Société Eclairage des Voitures—to develop rights held by the Thomson-Houston Co. Renault is a strong financial backer of this company. The details of the dynamo have been worked out by his staff, and naturally his cars are being equipped with it. In addition to Renault, the stockholders in this new company comprise many of the most influential

motor car manufacturers of France. Having shares in an electric lighting company, naturally they are interested in selling cars with lighting outfits.

Other firms not in this company have had to come into line and fit their cars with some dynamo on the market, or adapt them in such a way that a dynamo can be installed with the least possible trouble. About 30 per cent of the cars in the show have electric lighting as a standard equipment; another 50 per cent endeavor to force it on the customer by putting it on the chassis and only making a small allowance if it is not wanted; the remaining 20 per cent do not offer anything in the way of electric lighting.

The situation is quite different from America, for here very few cars are sold complete, and when a chassis only is being bought it is difficult to force in an electric lighting outfit if it is not wanted. Darracq appears to be the only firm selling a completely equipped car with electric lighting and giving no option for taking it without this equipment. Renault, Hotchkiss, Unic, Panhard, Delaunay-Belleville, Bayard-Clement, Berliet, Pilain are a few of the firms making a specialty of electric lighting.

There is infinite variety in the methods of driving dynamos. A good, and at the same time typical method is that on the Berliet. A friction wheel, the shaft of which is carried in a bearing on the aluminum dashboard, is maintained in contact with the flywheel by a coil spring. A pulley on the front end of this shaft, and on the motor side of the dashboard, allows of belt drive to the dynamo which is mounted within the dashboard. One half of the dynamo is on the driver's side and the other half on the motor side of the board. It is perfectly accessible for adjustment, and is thoroughly protected.

Self-starting is in quite a different position from electric lighting. The need for an automatic starter does not appear to have been felt and the firms offering it as a standard equipment are remarkably few. On the Berliet just mentioned, it is included, the electric motor being mounted on a platform alongside the gearbox and driving through helical gearing and an inclosed chain to the clutch shaft. Renault has fitted an electric self-starter to two of his town cars, but not to his touring models. Darracq has made provision for an electric self-starter as an extra. Delaunay-Belleville is offering a

compressed air self-starter but selling few. Brasier has electric lighting and self-starting on a six-cylinder model, as well as a power driven tire pump.

Detachable wood and detachable steel wheels are now proving a serious rival to the wire wheel. While the wood and steel types are not quite as quick in changing when new as the well known wire wheels, there is not much difference when the two sets have been on the road for 6 months. The advantages of the wood and steel types are lower cost of production and ease in cleaning.

Wire wheels find little favor with chauffeurs and men who wash their own cars. Renault is supplying all his cars with detachable wood wheels as a standard; Darracq is doing the same; Bayard-Clement is making the Sankey steel detachable wheel; Delaunay-Belleville sell about 75 per cent of their cars with wire wheels; the same proportion is observed by Hotchkiss. Peugeot is a large user of wire wheels. Unless they have a particular make of wood detachable wheel that they wish to push, makers do not offer any objection to supplying wire wheels, although this nearly always entails an extra charge to the customer.

Electric Vehicle Convention Draws Many to Chicago

F. W. Smith Elected President of National Association

CHICAGO, Oct. 28—The fourth annual convention of the Electric Vehicle Association of America was held here with sessions yesterday and today. There were several hundred in attendance, including garagemen, central station heads, and manufacturers of electric pleasure and commercial vehicles. The greater number of papers and discussions leaned toward the possibilities of the commercial vehicle taking the development of the electric pleasure vehicle very much for granted.

Miniature Show Is Held

The eighteenth floor of the building was used for a display of exhibit of manufacturers of vehicles and accessories, these being filled with those interested during the period of the 2 days' session, a considerable amount of good missionary work being accomplished.

Delegates and visitors on registering were given a set of the papers to be presented in printed form, together with literature dealing with the convention, and things pertaining to the electric vehicle industry in general.

The first session was held in the red room of the hotel on the nineteenth floor, a large part of this session being routine, and committee reports. A very comprehensive report was that of the committee on rates and charging, including a mass of data on central station rates in various cities, and discount rates in garages in various cities. Besides these

was included a report of the number of electric vehicles in use in different cities, both passenger and commercial.

The afternoon session was given up to two papers, the order of the program being changed so that the papers on "The Merchant, the Central Station and the Truck," by F. Nelson Carle, and "Cooperation Between the Electric Vehicle Manufacturer and the Central Station," by E. L. Callahan, were read consecutively, "Traffic Problems and the Automobile," by E. E. Pratt, of New York, following. The discussions were general and interesting, that of the first two papers rather severely criticising the indifferent attitude of many central stations toward commercial vehicles.

A beefsteak dinner finished the afternoon, after which a trip was made by electric motor cars to the larger Chicago south side garages. Following this was a smoker and cabaret attended by close to 300 delegates, visitors and guests.

Tuesday's Session

The Tuesday morning session included papers by Maxwell Berry, on "Charging of Storage Batteries in Unattended Garages," "Electric Vehicle Salesmanship," by George H. Kelly and E. J. Bartlett; "The Electric Vehicle in Department Store Service," by C. A. Duerr and David F. Tobias, and a paper on "Recent Developments in the Lead Battery for Electric Vehicles," by Bruce Ford.

Following the discussion of these papers came the report of the nominating committee and the election of officers, the following candidates being elected for the coming year:

President, F. W. Smith, United Electric Light and Power Co., New York; vice-president, J. F. Gilchrist, Commonwealth Edison Co., Chicago; secretary, Harvey Robinson, New York Edison Co., New York; treasurer, Day Baker, General Vehicle Co., Boston; directors, Arthur Williams, W. P. Kennedy, W. G. Bee and C. N. Stannard.

Interesting Papers Read

The afternoon session, the last of the convention listened to papers of the "Past, Present and Future of the Electric Power Wagon," by Walter Wardrop, "Electric Commercial Vehicle Tires," by F. E. Whitney, "How to Make the Business Healthy," by Ralph Temple, and a report of the publicity and advertising committee, by Frank W. Smith.

An invitation from the mayor and commercial clubs of Buffalo, N. Y., to hold the next convention in the electric city was referred to the board of directors for action.

WOULD NUMBER COUNTRY ROADS

Minneapolis, Minn., Oct. 24—At a meeting of the Yellow trail boosters with members of the Automobile Club of Minneapolis last night, L. J. Boughner of the Minneapolis Tribune outlined a plan

for the numbering of roads of Minnesota and adjacent states similar to the system announced by France. He proposed that all roads be numbered by a definite plan, the number being painted on telephone poles, fences, trees, boulders and artificial uprights at all road corners.

For example, beginning in southern Minnesota, he would number the first east and west road No. 1; the second, No. 3 and so on until the northern boundary was reached. Beginning at the eastern boundary, he would number the first north and south road No. 2; the second, No. 4, and so on, until the western boundary was reached.

He also proposed that each state have a distinctive color for its road numbers. Thus all Minnesota numbers might be red, South Dakota green, North Dakota yellow, Iowa black, and Wisconsin blue.

WORK ON KENTUCKY'S ROADS

Louisville, Ky., Oct. 27—Adverse weather conditions in nearly all sections of Kentucky prevented a full compliance with Governor James B. McCreary's recent proclamation calling upon the people to work the public roads Friday and Saturday of last week. Despite the rain and soft condition of the roads, however, thousands did what they could to improve the highways and a number of counties, notably Spencer, Laurel, Edmondson, Owsley and Leslie, as well as Franklin, where Governor McCreary himself led the volunteers, much good work was done, and, it is believed, the roads were permanently benefitted.

It developed that in many counties there was an excellent organization of workers, who would have given a good account of themselves had the weather been suitable. It is expected that Governor McCreary will be asked to name other days on which the people will be asked to assemble for work on the highways of the state.

TWO CLASSES FOR GRAND PRIX

Paris, Oct. 15—Two classes doubtless will be provided for in next year's French grand prix: machines of a maximum weight of 2,425 pounds without cylinder limitations; and cars having a cylinder area of not more than 4.5 liters or 274 cubic inches and a maximum weight of 2,425 pounds. Class A will be known as grand prix cars; class B will be designated cylinder trophy cars. The two races will be run together over a distance of 500 to 600 miles, it being quite possible for a car in class B to win the grand prix. The arrangement is somewhat similar to that adopted last year at Dieppe, when big cars and 3-liter machines raced together.

These recommendations have been drawn up by the sporting commission of the Automobile Club of France. Before becoming official they will have to be approved by the full club committee. As there is no case on record in which the

club has refused to endorse the action of the sporting committee, they may be accepted as definite.

It will be noticed that the originally proposed limitation of the number of tires has been abandoned. This introduced such a new element that manufacturers were afraid of it. A certain amount of opposition is being made to the no-limit rule. It is pointed out that progress in racing is only made when a definite problem is set the competitors. With no other limitation than weight, tires become the most important factor. In all probability each manufacturer will be allowed to enter five cars. The entry fee will be \$600 per car. Entries will close on January 31.

The Lyons district is the one having greatest chance of being adopted for this race. Andre Sautin, general manager of the grand prix, has carefully examined the proposed set of roads and reported very favorably.

OLD CADILLAC TESTED BY R. A. C.

London, Oct. 18—After 10 years' hard work on the road, a 6½-horsepower Cadillac car of the vintage of 1903 was put to a severe test recently to prove that it was still fit for active service. When first shipped to England 10 years ago, the machine participated in a 1,000-mile reliability run. Now used by a traveling chemist to peddle medicine, the antique was borrowed for 8 days and without being overhauled, put through a test similar to that of 1903, under the auspices of the

Royal Automobile Club. The car covered 1,019 miles at an average speed of 11.169 miles an hour. Seventeen hours and 36 minutes were spent in making repairs, none of a serious nature, as puncture, ignition adjustments, a broken gas line and a faulty water connection were the only reasons for stopping. The trial was held under R. A. C. observation.

AMERICANS IN MOROCCO TEST

Paris, Oct. 12—Paul Rivierre, driving a 14-horsepower Metallurgique, is the winner of the endurance test through Morocco, having covered the 521 miles in 16 hours 21 minutes, being at the rate of about 31 miles an hour. On the last of the six stages, from Mazagan to Casablanca, Rivierre was first, followed by Picard in a Peugeot, Gachet in a Ford, Decourt in an D. F. P., and Leblanc in a Hupmobile. An N. S. U. and a Berliet quit on this stage. The trip through Morocco was a difficult one by reason of the poor roads and at times entire absence of roads. The conditions much more nearly approach those in the southwestern states of America than in France. The American cars made a good showing, Gachet in a Ford being first in the class of machines selling at not more than \$1,200. In the \$1,200 to \$1,800 class the Hupmobile came second behind Rivierre's Metallurgique. Picard, in the Peugeot, covered the entire distance, but having started a day late could not be classed. Inadequate clearance and excess weight proved a handicap to several of the European cars.

World's Hour Record Again Broken

Twelve-Cylinder Sunbeam Beats 107 Miles

LONDON, Oct. 10—The glory of the world's record-breaker at Brooklands is not for long. This was again proven this afternoon when Jean Chassaigne, driving the twelve-cylinder Sunbeam which last week averaged 110.75 mile per hour in a 8.5-mile handicap race, shattered the world's 1-hour record by travelling 107 miles 1,672 yards in 60 minutes. En route the 50 and 100-mile records were shattered and at the expiration of 1 hour the new speed creation continued its trial and broke the 150-mile mark.

All the records established by the Sunbeam today were previously held by a Peugeot, driven by Jules Goux. The comparative marks of the two cars follow:

	Sunbeam		Peugeot	
	Time	M.P.H.	Time	M.P.H.
50 miles.	27:40.8	108.38	28:18.6	105.97
100 miles.	55:35.5	107.93	56:29.9	106.2
150 miles.	1:25:14.9	105.57	1:28:35.6	101.5
Time	Distance	M.P.H.	Distance	M.P.H.
1 hour..	107 miles 1,672 yards	107.95	106 miles 387 yards	106.22

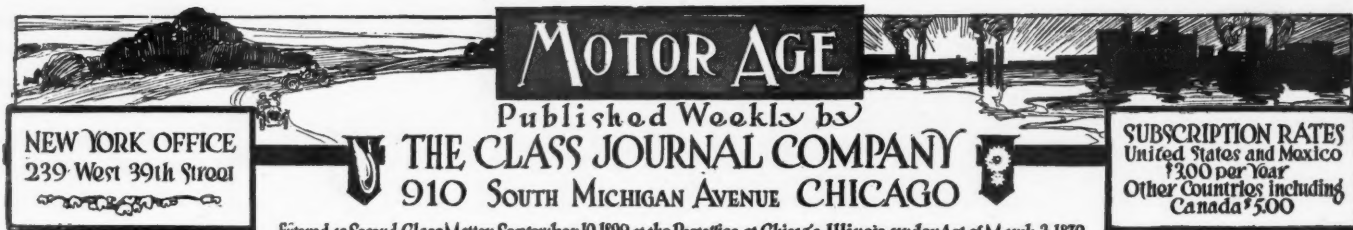
Chassaigne first tried for the 1-hour record Wednesday but a blowout and damaged shock absorber forced a postponement. Today the Sunbeam driver was instructed to drive cautiously for fear the

tires would not stand up under the strain of the record pace and to keep just inside the average lap time, 1 minute 32 seconds, made by the Peugeot in its record-breaking trial of last April. He followed instructions religiously and restrained his speed lust.

Although robbed of his 1-hour record laurels, Jules Goux will not return to France unadorned. Driving the 14-horsepower Coup de l'Auto Peugeot, the diminutive Frenchman established four new world's records in the 3-liter class today. As a result, his name will go down in the record books as the holder of the half-mile, flying kilometer, 1 mile and 10-lap marks. The records of the 3-liter Peugeot compared with previous best marks are as follows:

	Peugeot	
	Time	M.P.H.
Half-mile	16.95	106.19
Kilometer	21.14	105.81
One mile	34.17	105.36
Ten laps	16:29.35	100.68

Best Previous Marks		
Holder and distance	Time	M.P.H.
Sunbeam (half-mile)	17.67	101.87
Vauxhall (kilometer)	22.06	101.403
Vauxhall (one mile)	36.14	99.61
Vauxhall (ten laps)	17:14.11	96.32



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The French Show's Lesson

IT is possible only to draw semi-conclusions concerning the motor car tendencies of the old world from the Paris show, in that it does not fully represent the entire European industry, and before the final comment is made it will be necessary to wait until Olympia has opened its doors, and the complete review of the 1914 models put on. If our conclusions were based on Paris alone there would be every justice in stating that the six is almost an unknown quantity, because it cannot be found in the Paris show in any great numbers, and few French makers are using it with the exception of one or two, there being not a few cases where the six has been dropped

CONTINENTAL Europe does not want sixes for several reasons, the most important being the consumption of fuel, government taxes and heavier chassis. With the little four there seems to be all the speed needed, the necessary flexibility is present, and, in a word, the four seems to be the last word so far as they are concerned. It may be different after Olympia has opened, because England is one of the biggest car-consuming countries in Europe and England may have a much bigger showing of sixes.

FRANCE and America occupy the extremes in the six-cylinder field, in that for next year America is changing its fours into sixes as rapidly as possible, whereas France is eliminating sixes and specializing on fours. True, America is cutting its six-cylinder models to much smaller sizes, but France is doing likewise with her fours. France has her good roads, long smooth stretches, where the flexibility of the motor is not severely tested, whereas in America the virgin condition of miles of highways is exacting its tax in useless consumption of power.

THE French engineer has a liking for the four rather than the six. The four has demonstrated satisfactorily for him in racing. He likes the more compact chassis layout that is possible with it. He likes the compact motor with short crankshaft. He likes the reduced weight of the four; in a word, he believes in using a four but in cutting weight wherever possible in order to get more out of the four.

ONE advance that is generally noted in the new French motors is that of making all of the valve springs and actuating parts more accessible. The L-type cylinder casting is used and the motor appurtenances have been grouped so as to leave all of the valve parts entirely accessible. The inclosed valve springs are general and the cover plates for them are free for removal. The magneto is mounted lower and often the carbureter is higher, but in either case the springs and tops of the tappets are accessible. The French maker has demonstrated how it is possible to mount a magneto, water pump, charging generator and carbureter around a motor and yet leave every valve stem accessible. Americans can copy some designs to great advantage.

TO accomplish this some exceptionally good use has been made of the transverse shaft at the front, this shaft carrying in some cases the magneto at one end and the charging generator at the other. One concern has gone a step further than

all others in this accessibility story and has mounted the magneto, generator and carbureter in front of the crankcase, using a Renault type of hood with dash radiator. This maker certainly gets accessibility of parts, a fact that the owner will appreciate, not only because of the ease with which parts may be reached when emergency repairs are needed but also because of the reduced repair bills that the accessible car is bound to bring.

FRANCE has made a strong move towards the use of double brakes on the rear wheels, in contrast with one set on the wheels and another set on the gearbox, which has been required by law. America has led the world in fitting the double set on the wheels and it is gratifying to see France taking up this construction, which but bears out the fact, that the French engineer always is on the lookout for the best constructions which may be used.

THE brakes invariably are larger than formerly and use is made of ribs for cooling the drums, this construction being quite general where the two sets of brakes are mounted side by side within the drum. There is a commendable tendency to simplify brake adjustments, so that any adjustment may be made without a tool. The merit of such a construction is only realized when it is remembered that America has not a few makes of cars in which it takes from 1 to 2 hours to properly adjust the emergency brakes and that in general the private owner has to pay the same per-hour rate for this work as he would have to pay for a broken part or having a spring replaced. The slogan of French design, is reduced maintenance.

THE non-poppet valve is not so strong on the continent so far as the number of different types in use, but has increased greatly so far as the actual number of cars using non-poppets is concerned. The Knight type has made heavy gains during the year, two or three new concerns using it. There are other companies which have entirely dropped their non-poppets and a few others who are listing them. The history of the last few years shows unmistakably that several of the non-poppet designs were not feasible productions, but were marketed as money-making plans for inventors and investors. Several of these have been weighed and found wanting.

THE foreigner is wrestling with engine cranks and electric lights and with that characteristic European conservatism is determined not to be stampeded into the starter movement as were the American builders 2 years ago. The Frenchman is taking up the starter question slowly, and where he is fitting a starter he is charging extra for it. As in America the electric type is receiving greatest consideration, a fact well proven by the general acceptance of electric lighting which must be considered as one of the big features in the 1914 French models. The French builders are going to fit electric starters in the future, they seem to have their minds already made up to this, particularly in the larger models, but they are going to try to direct the movement and not let it run away with their factories.

Overland Report for Past Year Shows Large Profits

John N. Willys Re-elected President of Toledo Concern

TOLEDO, O., Oct. 28—The regular annual meeting of the stockholders of the Willys-Overland Co., held here today was unusually well attended. Of the 200,000 shares of common stock, 183,812 were present, 9,000 of which were represented by proxies, the balance in person.

The following officers were elected: President, John N. Willys; first vice-president, Isaac Kinsey; second vice-president, Charles Janeson; secretary, Royal R. Scott; treasurer, Walter Stewart; controller, A. H. Smith. These with Rathbun Fuller constitute the board of directors.

The annual reports of the president and treasurer were read and placed on file. These reports show an unusually prosperous condition, there being a net profit during the past year exceeding \$5,600,000. Prospects are for even better business for the future.

DEATH OF N. H. MINITER

Chicago, Oct. 28—The Findeisen & Kropf Mfg. Co., received advices today from Paris conveying the sad news of the death of N. H. Minter, former sales manager of the Rayfield company, who had resigned his position to go to Europe in search of health. Mr. Minter was suffering from a physical breakdown and passed away in Paris on October 9. He was one of the best known men in the carburetor field, one of the pioneers in fact, and before his Rayfield connection with that enterprise was with both the Stronberg and Schebler.

GROSSMAN JOINS WITH BARBER

New York, Oct. 25—As an outgrowth of a suit for alleged patent infringement started by William Barber against Smith-Haines for selling V-Ray plugs, the Motor Car Equipment Co. for selling Sootless plugs and the Lowe Motor Supplies Co. for selling Red Head combination plugs,

the Emil Grossman Mfg. Co., maker of Red Head plugs, has acquired part ownership in Barber's patent on which the litigation was based, it being the opinion of the Grossman company's attorney that the patent would be upheld in court of law. Since the Grossman company is now part owner of the patent, the suit against the Lowe Motor Supplies Co. will be discontinued.

BOSCH DEFENDING PATENT

New York, Oct. 25—With the increase of activity in the motorcycle and cyclecar industries, there has been brought to the notice of the Bosch Magneto Co. the fact that certain manufacturers of magnetos are constructing instruments that are said to be direct infringements of Bosch patents. Patent No. 974,967, issued to G. Honold, November 8, 1910, and which has been recognized as the basis for magneto ignition for gas engines of two-cylinder V-shape construction, is the invention which it is claimed is infringed upon. The Bosch company now threatens to take legal action necessary to sustain its basic patent.

INTERNATIONAL IN THE COURTS

New York, Oct. 27—It has been decided to adjourn until Wednesday, October 29, the hearing on the injunction against the voting trustees of the International Motor Co., which was to be argued in court today. In the meantime conferences are being held which may result in the matter being settled without further litigation. On Saturday last a broadside was fired into the company by the minority interests, who served an injunction on the management just when it had acquired sufficient consents to force through the \$1,200,000 loan. The committee appointed by the minority secured the injunction from the supreme court of Kings county, restraining the management from acting on the

proposed loan. At the same time it filed application for the appointment of a receiver. The latter matter will be threshed out in court at the coming meeting on Wednesday.

Fearing that minority shareholders might plunge the company into a receivership, controlling interests of the company announced that John Calder had resigned as president. Vernon Munroe, the secretary, was chosen as his successor. B. A. Guy, the treasurer, has been made secretary and treasurer.

SUE OVER TIRE MOLD PATENTS

New York, Oct. 27—A prayer for a writ of injunction, restraining the U. S. Tire Co. from manufacturing or using an apparatus for manufacturing wheel tires, or a tire mold, has been filed in the United States district court for the southern district of New York by the de Lashi and Thropp Circular Woven Tire Co., and the J. E. Thropp's Sons Co. The complainant claims that the U. S. tire people have infringed on patent no 822,561, issued to P. D. Thropp, of Trenton, N. J., on June 5, 1906. The complaint involves three other inventors, Ernest Hopkinson, C. L. Pepper and Thomas Midgley, who had in 1905 filed applications for patents covering the same device as Mr. Thropp's. A prayer for writ of injunction, as said before, has been brought, asking that the molds in the U. S. Tire Co.'s possession be destroyed or delivered into the complainant's hands and that the income derived therefrom be paid also.

PAIGE COMPANY REPORT

Detroit, Mich., Oct. 26—According to a financial statement recently drawn, a net cash increase of \$1,200,000 for the quarter ending September 30 was made by the Paige-Detroit Motor Car Co. of Detroit.

Willys Buys Edwards Company and Knight License

NEW YORK, Oct. 29—Special telegram —John North Willys today purchased for the Willys-Overland Co. the Edwards Motor Car Co., of this city, including its Knight license to manufacture sleeve valve motors and all patents, drawings and factory equipment stock, etc. The entire assets of the Edwards Company will be moved to Elyria, O., and located in the Garford plant, which is one of the Willys-Overland factories. Here the two Edward-Knight models will be manufactured in their present form under the new name of Garford-Knight and H. J. Edwards, the designer, will go with the Willys organization as chief engineer of the Garford factory. The consideration in today's sale of the Edwards Co. is one

dollar and other valuable considerations.

The two Garford-Knight models, one a four, which has been on the market all year as an Edwards-Knight, and the other a new six that has been on the road for several weeks, will be continued in their present form, carrying such characteristics and Knight sleeve-valve motor wire wheels, worm drive and cantilever rear springs.

The Edwards Motor Car Co. was organized a year ago last February by C. G. Stoddard and H. J. Edwards, both of whom were moving spirits in the Dayton Motor Car Co., builder of Stoddard-Dayton cars when the Stoddard factory was bought by the United States Motor Co.

The former went with this company as

a vice president and the latter as chief engineer. Stoddard and Edwards left the U. S. Motors in February, 1912, and immediately organized the Edwards Company and Mr. Edwards set about designing the present four-cylinder Edwards-Knight, the company having secured from Knight and Kilbourne Patents' Company the necessary license. The first car was put on the market a year ago and since then the manufacture has been carried on in a limited manner in the company's factory at Long Island City, Long Island. The healthy development of the company was held back by the lack of sufficient capital. With the present sale Mr. Stoddard severs his connection with the motor industry.

Captain W. M. Lewis Again Building Motor Cars

Former Mitchell President Associated with Rene Petard in Launching New Company
—Pope and American in Receivers' Hands

MILWAUKEE, Wis., Oct. 29—Announcement was made today of the organization of the Lewis Motor Co., of Racine, Wis., with an authorized capital of \$250,000 by Captain William Mitchell Lewis, E. B. Hand and Rene Petard, Racine, to manufacture and market motor cars. The announcement confirms rumors that have been in circulation for some time that Captain Lewis, who until a year ago was president and general manager of the Mitchell-Lewis Motor Co., of Racine, was to market a car of his own, designed by Rene Petard, a French engineer and designer who became associated with the Mitchell-Lewis company in 1912 and brought out its present product.

The new company has organized with these officers: President and general manager, William Mitchell Lewis; vice-president, E. B. Hand; secretary and treasurer, Rene Petard.

The concern has leased a large floor space in the former Racine-Sattley carriage works, situated directly opposite the mammoth plant of the Mitchell-Lewis Motor Co., at Racine, and on Monday, November 3, will start a production of 500 six-cylinder motor cars, the first of which will be delivered to dealers on or before February 1, 1914.

For nearly 8 months, it developed today, the promoters of the new company have been at work on the new car, three working models of which have been undergoing the most exhaustive road tests for the past 5 months.

So far as can be determined today, the new car will be named the Lewis. It will be manufactured exclusively in one type or model, a six-cylinder, six-passenger touring car of decidedly French leanings, designed by M. Petard. The car will carry a monoblock motor with a bore and stroke of 3½ by 6 inches, and will weight 3,100 pounds with complete equipment, including electric starter and generator, 36 by 4-inch wheels and tires, top, glass front, speedometer, horn, tools, etc.

The price of the new Lewis is not announced, but it is stated that the car will belong to the medium-priced field, between \$1,500 and \$1,850.

Captain Lewis is only son of William T. Lewis, one of the founders of the various wagon and motor car interests which in 1910 were consolidated under the name of Mitchell-Lewis Motor Co., with Captain Lewis as executive head and the elder Mr. Lewis as chairman of the board of directors. Captain Lewis had been intimately connected with the interests, previously having built bicycles and motorcycles for many years.

Rene Petard, now associated with Captain Lewis in the new venture, was for

many years general foreign representative for the Mitchell-Lewis Motor Co., and in the middle of 1912 was brought to America to redesign the Mitchell car.

Official announcement of the new company and its new product, the Lewis, is expected early next week. It is expected that the announcement will contain news of the organization of a strong American and foreign sales and marketing system, upon which Captain Lewis has been working for many months while the designer and factory forces have been developing the car.

CLAIM INTER-STATE IS BANKRUPT

Indianapolis, Ind., Oct. 27—Financial difficulties of the Inter-State Automobile Co., Muncie, Ind., took another turn last week, when a number of creditors filed a petition in the United States court here asking that the company be adjudged bankrupt.

The creditors signing the petition and who say their accounts aggregate \$6,660.74, are John C. Meyer & Co., Lowell, Mass.; Margaret Jenks, Port Huron, Mich.; the Merchants' Delivery Co., Chicago, and the Union Drop Forge Co., Chicago. They charge that the company is bankrupt.

Thomas F. Hart, president of the company, filed suit in the circuit court at Muncie recently asking that a receiver be appointed for the company. The court appointed Michael J. Broderick as receiver. Hart said the company's difficulties were due largely to a disagreement among stockholders, making it impossible to obtain credit for current operations. The federal court has appointed Rollin Warner receiver and he will displace Mr. Broderick.

RECEIVER FOR POPE-HARTFORD

Hartford, Conn., Oct. 28—Special telegram—The anticipated receivership of the Pope Mfg. Co., of this city, has become a reality. Judge Joseph P. Tuttle has appointed Colonel George Pope receiver of the company of which he is the treasurer. Colonel Pope has filed a bond of \$200,000.

Counsel for the company states: "The occasion for the receivership proceedings is the fact that the credit of the company was seriously restricted owing to the approaching maturity April 1, 1914 of an issue of \$1,000,000 of debenture notes which under their terms might shortly become due and payable. A further reason for the condition of the company is the general market for motorears. The business of the company in the motorear, bicycle and motorcycle departments will continue under favorable conditions, there

being no necessity, while the receivership is in progress, of meeting past obligations and the credit of a receiver, acting under orders of the court is the best."

It is confidently expected that the creditors will be paid in full and that the stockholders will receive a substantial dividend through receivership proceedings on their holdings, or will be put in a position to reorganize the company on favorable terms and prospects.

The Pope company has outstanding \$1,000,000 in 2-year, 6 per cent notes. At the time these were issued it was stated that part of the money would be used for cleaning up a floating debt of approximately \$250,000. The issue of the notes was under a trust agreement that the company shall maintain at all times during the life of the issue a surplus of quick assets over all indebtedness of at least \$500,000 and that no mortgage shall be placed on any property while the notes are outstanding.

The proceedings will in a measure give the company a chance to get straightened out. It is confidently expected that the concern will pull out of the difficulty in good shape.

MICHIGAN ASSETS TO WINTERNITZ

Kalamazoo, Mich., Oct. 25—The plant and property of the defunct Michigan Buggy Co. was sold this week to Samuel Winternitz Co. of Chicago for \$225,000 as a result of an agreement consummated by the purchaser, the creditors and Federal Judge Sessions. By the terms of the sale, Kalamazoo interests have 20 days in which to repurchase the property. At the expiration of that time, the Winternitz company is at liberty to dispose of the property as it wishes. Simultaneously with the sale of the company, Victor L. Palmer, the treasurer, filed a voluntary petition in bankruptcy, giving his liabilities as \$1,600,000 and his assets as a little over \$21,000. He is said to be dangerously ill.

HARRIS BUYS CUTTING ASSETS

Detroit, Mich., Oct. 28—The Harris Bros. Co., Chicago, bid in the entire assets of the Cutting Motor Car Co., Jackson, Mich., at the receiver's sale held October 22 for the sum of \$35,000. This includes property, merchandise and materials, and in fact everything except any preferred accounts which may exist. The sale was confirmed by the federal court on October 25 and is the outcome of the lengthy negotiations which have been under way to secure more money for the property, which is appraised at \$173,155.

The first time the property was offered it was bid in by W. M. Thompson, president of the Jackson City Bank, for \$30,-

000, the Harrises having offered \$25,000 at that time. But the court refused to accept this bid from Thompson on protest from a number of the creditors that more could be secured by the appointment of a trustee. Bela J. Lincoln, Detroit, was appointed in this capacity and a period of 15 days granted for the securing of further bids. The later Harris bid was the result.

Harris Bros.' bid was in the form of a guarantee of the amount stated, the firm to receive 15 per cent on the yield of all the assets, any amount realized over the \$35,000 figure being shared in by the creditors. The Harris Bros. concern is now investigating the property and expects to continue the business if conditions warrant.

FRIENDLY RECEIVER FOR AMERICAN

Indianapolis, Ind., Oct. 29—Frank E. Smith, vice-president, was yesterday appointed receiver for the American Motors Co., with an order from the court to continue manufacturing with no interruption to business. The action was precipitated by a few smaller creditors desirous of forcing immediate payment of their claims, notwithstanding over 90 per cent had agreed to an extension plan which provided for the payment of claims in installments.

RUSSELL STATEMENT SHOWS LOSS

Toronto, Ont., Oct. 25—The recent financial stringency has been a severe period for the Russell Motor Car Co. The annual statement show a net loss for the year ended July 31 of \$152,826, as compared with a profit for the preceding year of \$180,127. Dividends were paid of 7 per cent on the preferred and 3½ per cent on the common stock, totalling \$112,000, which, along with the deficit from operation, had to come out of the surplus.

The statement leaves no lingering doubt as to why the directors last week announced that the preferred dividend for the first quarter of the new year would be deferred. As a profit, the balance of \$303,233, was brought over from the previous year, there still remains a balance of \$38,307. The common was at its height for the year in February at 91, and it has been as low as 37. The high for the preferred this year was established at par, and it has fallen to 69%. Since these securities were listed in 1910 the common has sold as high as 115 and the preferred as high as 118.

GOODYEAR FIRE IN MILWAUKEE

Milwaukee, Wis., Oct. 28—The Goodyear Rubber Co.'s Milwaukee branch, 384-386 East Water street, which is state distributor for the G & J brand of United States Tire Co., was wiped out by a fierce fire on Sunday night, which cost the lives of eight firemen. The adjoining building, two floors of which were leased by the Goodyear company for stockroom, was destroyed by an explosion, while the Good-

year building was gutted. The loss is almost total and both buildings will have to be entirely rebuilt. The Goodyear company carried a large stock of tires and other rubber goods for motorists, including clothing. Its loss will amount to \$225,000, with insurance of not over 60 per cent. A new retail and wholesale store has already been opened at 338-340 East Water street, which is being stocked from the Goodyear factories in the east and the auxiliary stock warehouse in other parts of Milwaukee. James Suydam is district manager and Victor Stamm is manager of the Milwaukee business.

KEETON TEST TRIP FINISHED

Detroit, Mich., Oct. 27—H. H. Newsom, vice-president and general manager; Charles Drum, factory manager; Ralph Brown, chief engineer; C. E. Cox, factory superintendent; J. Wallabach, foreman, and Charles Piquette, chief of the electrical department, all of the Keeton Motor Co., returned to Detroit yesterday morning, completing a 2,500-mile tour in three of the new 1914 model Keeton cars. The long trip of 2,500 miles was completed in spite of almost 2 weeks of rain and terrible roads at an average speed of 18 miles per hour. The route taken by Mr. Newsom and party was from Detroit to Cincinnati, thence to Louisville, Nashville, Atlanta, Augusta, Columbia, Raleigh, Richmond, Staunton, Chambersburg, Pittsburgh and Cleveland. The three models went through the entire journey with no trouble whatsoever except a broken spring and a few side slips into ditches and off the road. No other than their own power carried the cars along.

BIG DEMAND FOR SHOW SPACE

New York, Oct. 28—Although it is generally known that practically every inch of floor space has been allotted to exhibitors for the show to be held in the Grand Central Palace, January 3-10, Manager S. A. Miles has been besieged daily for more space by manufacturers of cars and accessories who are not affiliated with either the Automobile Chamber of Commerce or the Motor and Accessories Manufacturers, Inc. Last week car allotments were made for the New York show to the Allen Motor Co., Cameron Mfg. Co. and the Crescent Motor Co.

DECISION IN OIL SUIT

Chicago, Oct. 25—The word "Keystone" as applied to greases and lubricating oils, belongs to Augustus C. Buzby, doing business as the Keystone Lubricating Co., because of his introduction of his product under that name in 1885. This is the decision of the United States district court for the northern district of Illinois. The suit in which the validity of this trademark was established was fought between the Keystone Lubricating Co., of Philadelphia, Pa., and the Keystone Oil and Mfg. Co., of Chicago.

The court ordered that the Chicago concern should incorporate its lubricating grease business under some other name, or adopt some other plan to avoid infringement.

DECISION FAVORS OWNERS

New York, Oct. 27—A decision of interest to owners was handed down by Justice Cohalan in the supreme court on Saturday in the case of Davis vs. the Anglo-American Tire Co. It is held that the owner of a motor car may not be held liable for damages incurred through the negligence of a chauffeur not in performance of his duties, even through the chauffeur in question was operating his employer's car with the employer's knowledge and consent.

MASON BUSINESS CONTINUES

Waterloo, Ia., Oct. 25—Ira J. Hoover, receiver for the bankrupt Mason Motor Co. of Waterloo, Ia., has been given authority by the court to continue the business of the concern and to raise a sum, not to exceed \$5,000, on receiver's certificates to meet immediate expenses. Two thousand dollars is to be paid the employees for wages. Hoover's bond has been fixed at \$25,000.

SPLITDORF CHANGES

New York, Oct. 28—Important executive changes have been made in the recent process of incorporation of Splitdorf Electrical Co. branch houses. The Splitdorf Electrical Co., of Detroit, is now incorporated with C. E. Brelsford as president, H. J. Hinley as treasurer and manager and W. J. Murray as secretary. The Splitdorf Electrical Co., of Chicago, has been incorporated with R. S. Prohle as president and manager and E. A. Kelley as secretary and treasurer.

WOODARD QUILTS WOODS

Chicago, Oct. 28—O. J. Woodard, sales manager for the Woods Motor Vehicle Co., has resigned, to take effect on January 1. Mr. Woodard has no definite plans for the future.

ARGO TO MARKET TRACTORS

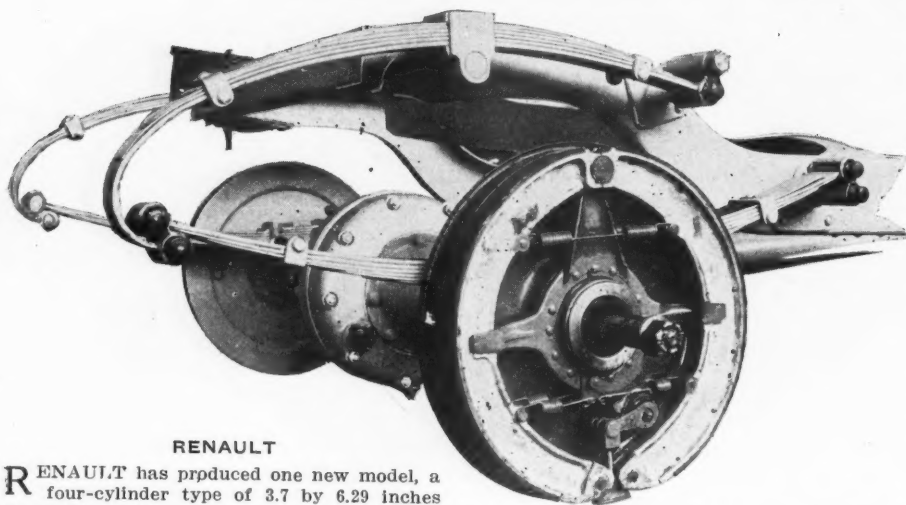
Chicago, Oct. 26—From Carl Metzger, selling agent for the Argo electric, comes the news that the Argo Electric Vehicle Co. will in a short time market a line of electric tractors. Experimenting on these machines has been going on for 2 years and the final and improved product will be ready for delivery in a short time.

FOX AN INDIANAPOLIS ENTRY

Indianapolis, Ind., Oct. 28—The re-entry by Frank P. Fox, an Indianapolis sportsman, of his specially constructed flier, known as the Gray Fox, in the next Indianapolis 500-mile race at the motor speedway, marks the fourth car to register for that event.

Review of Features of the French Cars

Constructional Points of 1914 Renault, Darracq, Peugeot, Gregoire, Hispano-Suiza, Hotchkiss Sizaire-Berwick and Charron,—Table of Motor Sizes



RENAULT

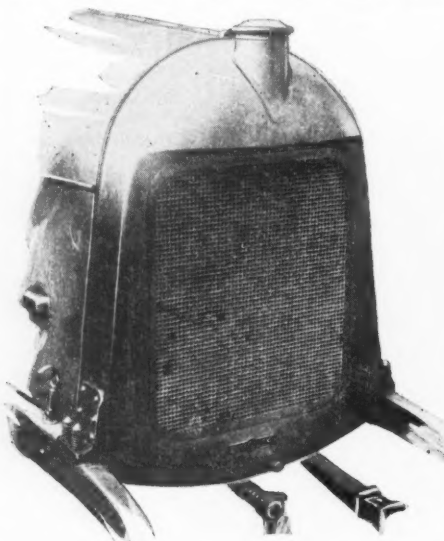
RENAULT has produced one new model, a four-cylinder type of 3.7 by 6.29 inches bore and stroke, officially rated at 18-horsepower. This new type, which will replace two of the 1913 models, comprises several new features. An electric lighting set is a standard equipment. The S. E. V. dynamo is placed right in front of the motor and is driven by a pinion driven by chain from the magneto shaft. The platform for the dynamo is cast with the crankchamber, the dynamo being held down by a flexible steel band, as in the case of the magneto. Renault is using chains for the first time this year. They are three in number: from crankshaft to camshaft, from crankshaft to magneto shaft, now placed on the right-hand side of the motor; and from magneto shaft to dynamo shaft mounted in the vertical plane of the crankshaft. The chains are not adjustable; the distance between the centres is 5 inches. In order to accommodate the dynamo in front, which is really a most accessible position, it has been necessary to lengthen the bonnet. The extra length is taken ahead of the front axle, so as not to diminish the space available for the body. Owing to the necessity for lengthening the bonnet, it has not been possible to place the dynamo in this position on the smaller cars. The dynamo is set up as close to the timing gear housing as possible, no driving mechanism being visible. The use of the dynamo makes it necessary to place the magneto alongside the motor, on the right-hand side, and back of the timing gear housing. The magneto is an automatic advance Bosch. For the first time, also, Renault has adopted a five-bearing crankshaft, in place of the three-bearing shaft used up to the present. With a view to simplicity, the intake piping has been entirely incorporated with the cylinder casting, and everything connected with the carburetor is now carried on the right-hand side. The carburetor, which has undergone but detail changes, is connected up by a straight length of piping having branch arms connecting to each of the pair castings of the cylinders. This arrangement simplifies the valve side of the motor, making the valve springs perfectly accessible. These are naturally inclosed, the valve tappets are adjustable, and there is a breather between each pair of valves. The exhaust manifold is separate and is common to the two groups of cylinders. The circulating lubricating system is practically unchanged. A three-way cock is fitted, with a steel stem

PANHARD'S LARGE DIAMETER SIDE BY SIDE BRAKES

attached to the handle so as to form oil gauge. The stem is graduated and can only be withdrawn when the cock is in the closed position.

Instead of cast iron, the flywheel is now of steel and has a greater face width than the old one. The sheet metal fins are not rivetted on, but are passed through slits in the wheel and their projecting end hammered over. Renault maintains the housing around the whole of the mechanism between clutch and gearbox. The lower half of this housing is an extension of the crankcase. The upper half is detachable and is held in position by a couple of hinged bolts and nuts. All the clutch withdrawing mechanism is contained within this housing, as well as a flexible coupling composed of steel discs.

The gearbox is an entirely new production, for this year, for the first time, Renault makes use of a four-speed gear set with selective change. The shafts are



New honeycomb type radiator on Gregoire with large-capacity projecting header tank. Note that filler is big enough to pass hand into radiator

mounted one above the other, and the direct drive is at the front of the gearbox. The quadrant is small and is outside the frame member. The new box is hung to a couple of transverse frame members. Last year's type of quick-opening oil-filler and level placed on the side of the box, has been maintained. There is practically no change in the final drive and in the rear axle, with the exception that the thrust bearing is now made adjustable from the outside. The footbrake is internal expanding, the drum being ribbed. Storage batteries are carried in a metal box hung to the inside of the right-hand frame member, alongside the propeller shaft.

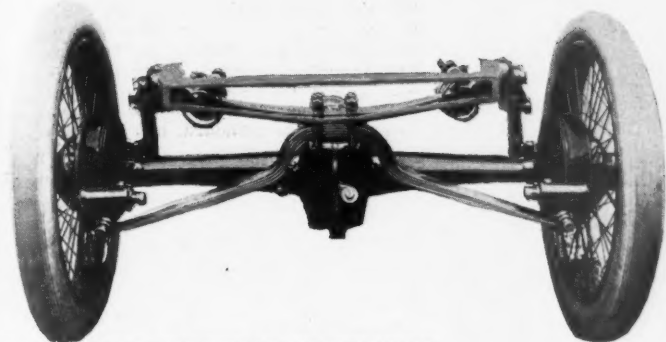
On two of the smaller Renault chassis, with specially dropped frame designed for town bodies, an electric self-starter is fitted. The motor is carried alongside the gearbox and drives by means of a friction disk in contact with the face of the flywheel. It is considered by Renault that a self-starter is most useful for town work with frequent stoppages and restarting, and that there is not much necessity for it on a touring model.

DARRACQ

The 1914 season will mark an entirely new period for Darracq. The Hanriot rotary-valve motor has entirely disappeared. As a big expenditure had been made on the detail improvement of this type of engine and a very extensive advertising campaign made on its behalf, its complete withdrawal is evident proof that it has not proved as satisfactory as the poppet-valve type. The entire Darracq works have been turned over to an English engineer, Owen Clegg, formerly connected with Rover and Wolseley. Under the new management two models only are produced, this being in harmony with the general European tendency to cut down the number of types to the lowest possible quantity. There may be other cars figuring on the catalog, but they are merely old types which are being worked out.

The two Darracqs are four-cylinder poppet-valve models of 75 by 120 millimeters—2.9 by 2.7 inches—and 85 by 130 millimeters—3.3 by 5.1 inches—bore and stroke, respectively. More attention is being paid to the bigger than to the smaller model, the former being the one in which most improvements have been incorporated. New features are a monoblock motor with intake and exhaust manifold cast integral, underneath worm drive, electric lighting as a standard equipment, a special streamline body, and such improvements as new suspension, new brakes, improved steering gear, etc.

The new Darracq motor is distinctive by reason of its clean-cut appearance. It is no longer mounted on a subframe, but is carried directly on the main frame members and inclined in order to obtain a straight-line drive to the underneath worm. The webs between crank chamber and frame members are completely filled with the aluminum casting, adding to the clean appearance and avoiding the use of an underpan. Cylinders are of the L-type, valve stems being inclosed and adjustable tappets having fiber heads. Silent-chain drive is used. A broad chain goes from crankshaft to camshaft, and a narrower chain from camshaft to magneto and pump shaft. The pump is to the front of and the magneto to the rear of the timing gear housing. No



REAR SPRING SUSPENSION ON DUDAILLE

adjustment is provided for the chains, for as the distance between the centers is only 5 inches it is declared that the amount of stretch is really negligible if the chains have been bedded in before sending the car out.

An interesting departure is the use of cast iron bearings for the camshaft. These have been given a most thorough tryout and have proved satisfactory in every respect. They have the advantage for the manufacturer of being cheaper than any other type of bearing. White metal is used for the connecting rod bearings.

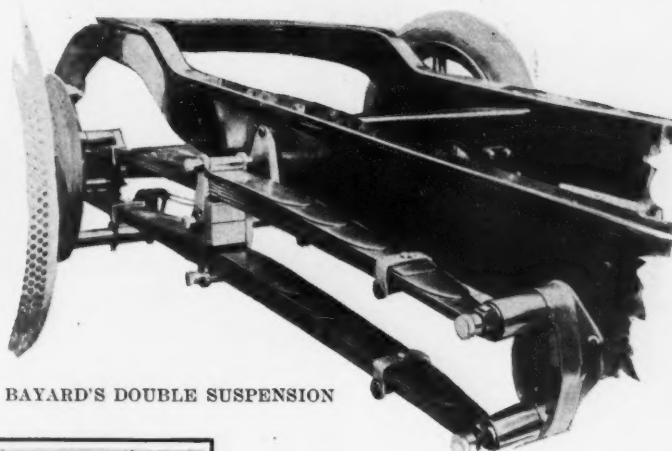
On the front end of the camshaft there are two pulleys. One of these drives the ventilator fan, which has an automatic tensioning arrangement, by means of a coil spring, and the other operates the C. A. V. dynamo carried on the crankcase arm on the right-hand side. This firm is adopting the Mea magneto as standard; advance is variable. The S. U. carbureter, bolted up direct to the cylinders, also is a standard equipment. A leather disk flexible coupling is interposed between the magneto drive shaft and the magneto.

The oil capacity has been increased to 10 pints, this being a feature having received attention by nearly all European manufacturers. The system is the circulating type with direct delivery to the main bearings and a constant level trough for each connecting rod. The troughs are fixed. The oil filler acts as a breather. It is placed near the left-hand rear crankcase hanger and has a wire gauze lid. Within is a cup-shaped filter through which the oil passes on its way to the crankchamber. The level indicating cock is just to the left of the filler. There is nothing to indicate that the oil is circulating.

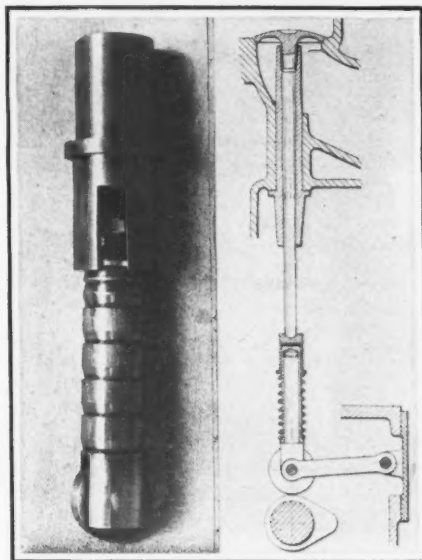
A new gearbox has been designed. It is of cast steel, carrying the two shafts in the same vertical plane, and is attached at the front to a tubular frame cross member and at the rear has two arms encircling the brake drum and bolted to a stout channel section cross frame member. Four speeds are employed, this also applying to the smaller model. The braking surface has been considerably increased. The foot brake, which is external with ribbed shoes, has a drum measuring 2.7 by 9.4 inches. The rear wheel brakes are internal and same size. This may be taken as a fair average size for European cars of medium power.

The worm-driven rear axle is an entirely new departure for Darracq. One of the features is the particularly robust mounting of the worm wheel. The underneath placing of the worm solves most of the lubrication difficulties, but as an extra precaution a liberal space has been left in the base of the housing for a large quantity of oil. There is a filler at the rear which also acts as level indicator. The torque tube used with the bevel-driven models has given way to a triangular torque member.

The axle housing is in two symmetrical parts. This suspension may be mentioned



BAYARD'S DOUBLE SUSPENSION



On left—Unic pushrod designed to draw up oil. On right—Sizaire-Berwick valve which is guided right up to the head and requires no guide. Note how adjustment is made on push-rod

as an example of general European tendency. Rear springs have a width of 2.1 inches and a length of 51 inches. Both these dimensions have been increased since last year.

Springs are seated under the axle, the frame having a kick-up over the rear axle and a sharp downsweep at the extreme rear. The rearmost transverse frame member has big angle members and forms a box construction. This suspension and type of rear frame may be taken as typical of present European tendency. The depth of the frame members has been increased to 4.7 inches. The thickness is 4 millimeters.

Although electric lighting is a standard equipment, the car not being sold without this set, the self-starter is made optional. It is of the C. A. V. type, the electric motor being mounted within the frame under the floor boards and starting the engine by a friction disk brought into contact with the face of the flywheel. Detachable wood wheels are the standard equipment.

The new radiator is typical of European tendency. It is of the honeycomb type, all the angles being gently rounded off so as to avoid the rough break and harsh appearance present with the ordinary type of radiator and accentuated by reason of the sloping bonnet and the easy rise into the scuttle dash. This rounding off of the radiator is common to all the best European cars and is a detail refinement in the effort to avoid harshness. The gasoline tank is in the dash. The filler has a glass top, and its diameter

is sufficient to allow the hand to be passed into the tank.

Although there is nothing of startling originality in the new Darracq, this car may be studied with interest as an embodiment of all the best European tendencies of the season. It should be remembered that this is a popular type, designed to sell at a reasonable figure, and ultra refinements are naturally barred out on commercial grounds.

PEUGEOT

Peugeot is showing but one new model, a 40-horsepower car made with long and short chassis for respectively touring purposes and as a sporting type. It is a four-cylinder in pairs of 115 by 180 millimeters—4.4 by 7.08 inches—bore and stroke. Only one model is made with worm drive; this is the 14-horsepower car with four cylinders of 80 by 140 millimeters—3.1 by 5.5 inches. The Baby Peugeot, which really may be considered a cyclecar, is now made in two models, one having the original two speeds and reverse, and the other three speeds ahead.

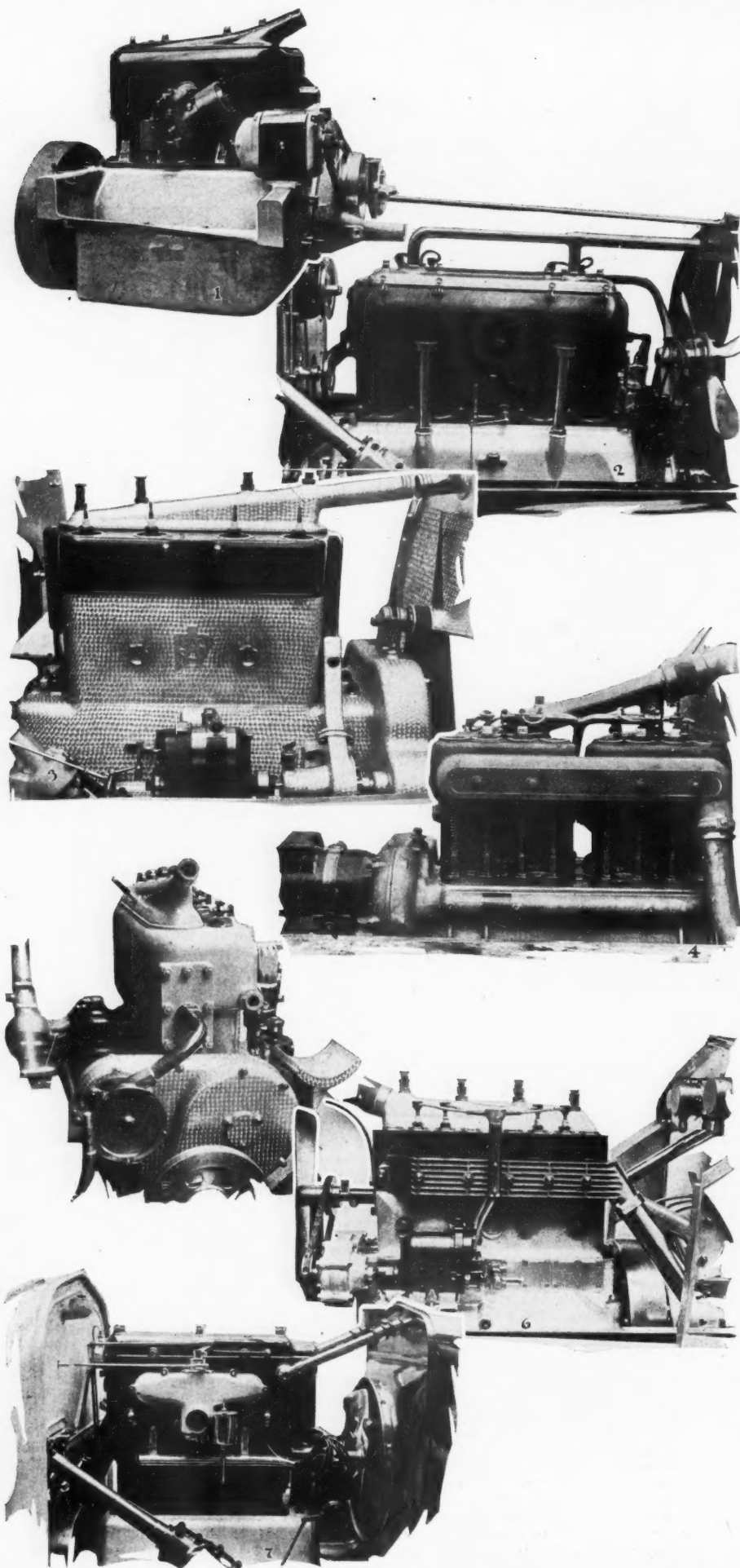
The 40-horsepower Peugeot is a remarkably clean-cut motor with pair casting of the cylinders set very close together, having external exhaust manifold and the carbureter on the side opposite to the valves. The magneto is on the valve side. The pump is driven from a cross shaft at the front of the motor, this shaft also being intended to drive an electric lighting dynamo. On this, as on all the other Peugeot models the system of lubrication is by pressure to the main bearings and by means of troughs to the connecting rod ends. A four-speed gearbox is fitted, and final drive is by bevel gears, the drive being taken through the springs and a triangular torque member being fitted.

On the sporting type unusually large diameter brakes have been fitted both on the rear wheels and on the rear of gearbox. All drums are ribbed. The springs are broad semi-elliptics at the rear the frame member being given a pronounced kickup over the axle, which is carried on the top of the springs, then sweeping down at the rear.

GREGOIRE

The direct influence of modern racing can be seen in the demand in France for what are, popularly known as sporting type cars. These are light, speedy cars of small, or comparatively small, cylinder area, but of very high efficiency. They are, to a very great extent, the outcome of the 3-liter racing movement. To meet this demand for higher speed than is possible with an ordinary type car, manufacturers are building special semi-racing motors or are modifying their standard motors with a view to higher power. This explains why the L-type motor is the generally accepted type and yet there are several cases in which manufacturers are adding T-types and overhead valve types.

Darracq gets a sporting type by lighten-



ing the reciprocating parts, modifying the timing and putting on a bigger carburetor; Panhard adopts similar methods with a Knight motor. Hispano-Suiza, which always has made T-type motors, has a new valve in the head type for very fast work. Gregoire, with L-type as standard, has built a T-type for sporting purposes.

This new motor is a four-cylinder monoblock of 70 by 140 millimeters—2.7 by 5.5 inches bore and stroke. It has a two-bearing crankshaft, steel pistons and big diameter valves with the stems inclined outwards. Rated at 20 horsepower, it is guaranteed to develop 38 horsepower at 2,800 revolutions and with two-seated body has a guarantee of 63 miles an hour. The radiator is a new model, honeycomb type, with an unusually big header tank projecting ahead of the body of the radiator and having its angles rounded off. The filler is big enough for a man to pass his hand into the radiator.

The car has four-speed gearbox and bevel-driven rear axle of floating type. This axle has been redesigned and is built up of forged steel taper tubes and a centrally divided cast steel differential housing. Gregoire has retained the two sets of brakes on the rear wheels, but has increased the diameter and fitted the shoes with ribs to assist cooling.

Last year a small power plant with unit construction was put on the market. This has undergone changes. The unit type motor and gearset has been put into a broader and longer chassis intended to receive closed bodies for town work. The motor is only 65 by 130 millimeters—2.5 by 5.1 inches—bore and stroke, but it is considered sufficiently high-powered for this class of work, the bodies fitted being coupes and coupelimousines carrying four persons inside. The rear axle on this model is of the overhead-worm type, as used last year on the roadster.

HISPANO-SUIZA

With a reputation for speedy cars and high-efficiency motors, the Hispano-Suiza company has abandoned the L-type in favor of overhead valves with inclosed overhead camshaft. The firm retains a T type of 80 by 180 millimeters—3.1 by 7.08 inches—making it mostly with short chassis and two-seater sporting type body. The three new overhead-valve models are respectively 80 by 130, or 3.1 by 5.1 inches, 90 by 150, or 3.5 by 5.9 inches, and 100 by 180, 3.9 by 7.08 inches. The change from L to overhead type undoubtedly has been made with a view to high efficiency, these new motors having a more efficient type of combustion chamber, less heat losses, and being capable of turning at a higher number of revolutions.

A monobloc casting is employed on all three models; this casting also includes the housing for the vertical shaft driving the overhead camshaft. The exhaust manifold is separate. Instead of a three-bearing crank-

EUROPEAN MOTORS

1—New Darracq motor showing S. U. carburetor bolted up direct to cylinder casting; also C. A. V. electric lighting dynamo with belt drive

2—Forty-horsepower Berliet motor. Note dynamo on dash, block casting and cross shaft in front

3—Pilain L-type motor with neat water intake

4—Renault 18-horsepower motor showing valve side with cover plate removed. Note new exhaust manifold, chain-driven timing gear and electric lighting dynamo

5—Unic motor showing platform for electric lighting dynamo

6—New Sizaire-Berwick motor

7—Intake side of Hispano-Suiza, with valves in the head

shaft, the cars have four bearings: a long bearing at each end, and a short bearing between the first and second and between the third and fourth cylinders. It is claimed that with a compact monoblock casting there is no necessity for a bearing between each cylinder.

The overhead camshaft is driven from the front of the motor by skew gearing, the pinion being mounted on the center of the front bearing—with a bearing in front and to the rear of it—and the vertical shaft is carried in cast iron bearings. The camshaft is a single piece and also is carried in cast iron bearings, these being three in number. Rocker arms with roller ends are used for operating the slightly inclined valves. These rocker arms are simply placed in position on horizontal axis combined with the camshaft bearing and are merely held in position by projections on the inner face of the overhead cover. When this latter has been taken off the rockers can be withdrawn without the use of any tool. This facilitates the withdrawal of a valve spring, but to get the valves themselves out it is necessary to dismount the cylinders.

Compensating cams are fitted on the camshaft. These are two supplementary and specially profiled cams with a spring-controlled braking surface in contact with them, the amount of friction of course depending on the contour of the cam. This device compensates the irregularities of rotation of the camshaft and prevents chattering of the teeth of the pinions. In view of the greater difficulty in dismounting the valves, the stems are made 12 millimeters in thickness instead of 8 millimeters as formerly. The plugs, two per cylinder, are slightly inclined towards the summit of the combustion chamber, and are just below the valve seating.

On previous Hispano-Suiza models the lubrication has been by forced feed to all bearings. On the new cars it is of the circulating type with troughs under the connecting rods. A feature of the troughs is that the front edge is lower than the rear edge, the height being regulated to give a sufficient quantity of oil when running on the level. By reason of the inclination of the car when hill-climbing the quantity of oil in the troughs is increased.

The oil pump is driven off the lower end of the vertical shaft. An air pump for maintaining pressure on the gasoline tank is operated from the front end of the overhead camshaft. There is a reserve oil tank on the dashboard, with a connection to the base chamber, a constant level of oil being maintained in this latter by means of a float and needle valve on the principle commonly employed for carbureters.

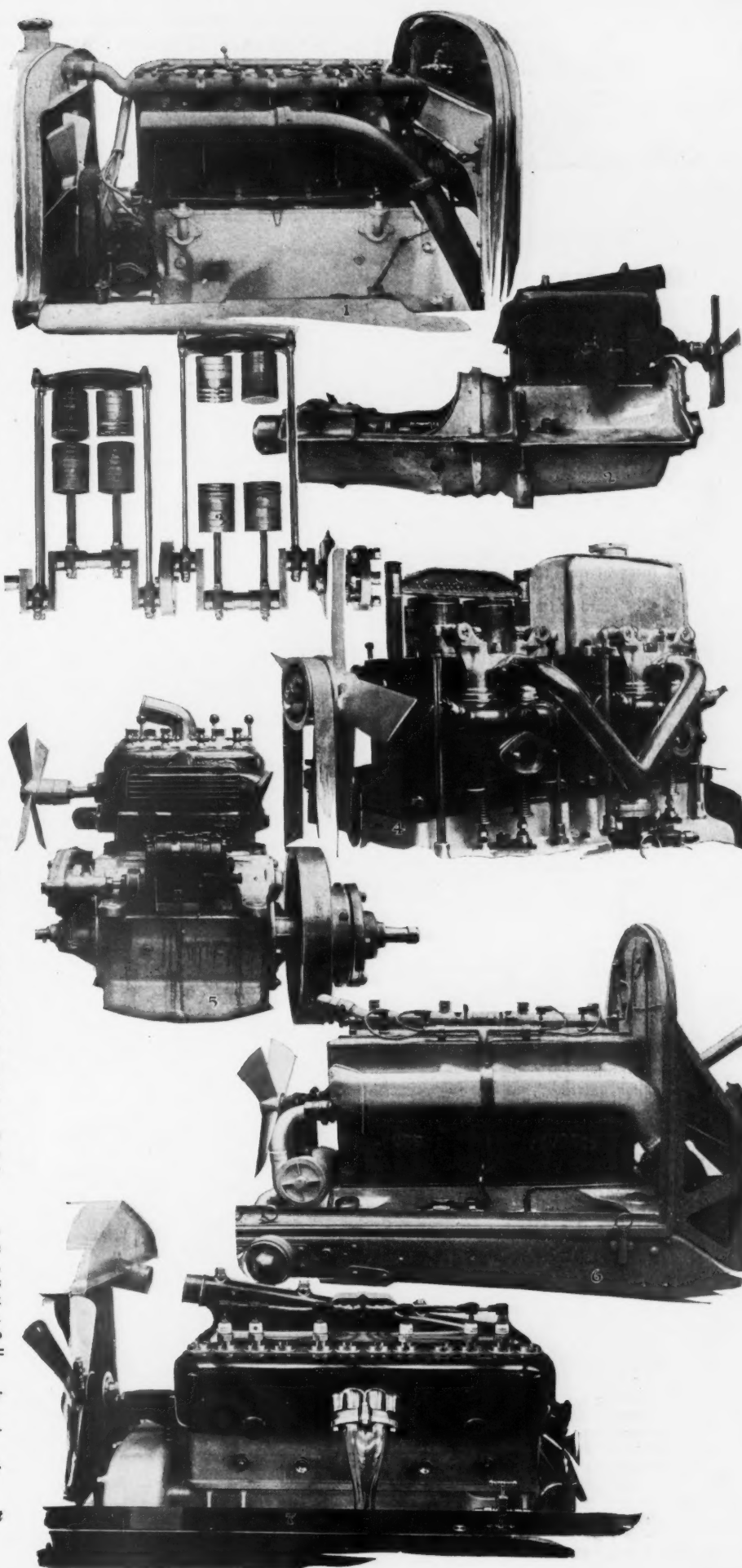
The magneto and water pump are across the front of the motor. There are two water outlets, one at the left and the other at the right-hand side of the casting.

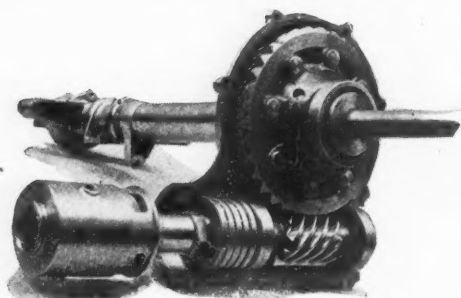
HOTCHKISS

A lengthening of the piston stroke, improvements in cylinder casting, electric lighting as standard, improved lubrication, flexible camshaft pinion, improved brakes and springs are among the more important of the changes on 1914 Hotchkiss models. The firm is practically confining itself to

EUROPEAN MOTORS

- 1—Panhard motor found on 20-horsepower sporting type
- 2—Small Gregoire motor with unit construction
- 3—Gobron crankshaft with double pistons. Note central ball bearing
- 4—Gobron double-piston motor
- 5—Exhaust side of Alcyon motor for light two-seater
- 6—Forty-horsepower Peugeot motor
- 7—Delage six-cylinder monobloc motor





DETAILS OF DARRACQ WORM DRIVE

four; sixes are being made, but they are not shown at the Paris salon.

Changes in the cylinder casting comprise the abolition of the detachable water-jacket plates used last year. They may have had the advantage of allowing scale to be cleaned out, but they were contrary to public taste. Advantage has been taken of the redesigning of the cylinder casting to give bigger passage for the exhaust and a straighter passage for the intake gases. The 95 by 140 millimeters—3.7 by 5.5 inches—model is a block casting; the 110 by 150 millimeters—4.3 by 5.9 inches—model has cylinders in pairs but set very close. In each case the intake manifold is integral and the exhaust separate and ribbed on front and top.

Although the crankshaft has a central bearing, the crankcase is a single piece casting with detachable end plates; the bottom plate merely serves as an oil retainer. The motor is carried direct on the frame members. The forced feed lubrication system introduced last year has been modified. The oscillating pump, driven off the crankshaft, delivers oil at one end of the crankshaft, forcing it right through to the connecting rods and to the central and front bearing. The addition is a lead from the rear end of the crankshaft to a tube along the outside and near the bottom of the crankcase, from which there are leads to the three main bearings.

There is the same pressure of oil in this tube as in the hollow crankshaft, and it serves to supplement the direct delivery of oil through the shaft. When new, or while the motor was in good condition, the original system was quite satisfactory; but as wear set up in the bearings oil leakage was apt to reduce the pressure to such an extent that the front bearing was apt to be starved. This addition serves to equalize the pressure.

The camshaft pinion is spring-mounted. The inner, smaller diameter part, mounted on the end of the camshaft, carries four sets of flat blade springs fitting into notches on the larger diameter portion on which the teeth are cut. The general arrangement is similar to the flexible coupling sometimes used for magneto drive. It is maintained that this spring mounting not only stops all chattering but acts as an efficient damper against vibration.

There is a somewhat similar arrangement on the universal joint between clutch and gearbox. A star piece is formed by two sets of blade springs, one set notching into the other and securely held by a couple of square cover plates and rivets. The spring ends are received respectively in the jaws of the driving and the driven members. The whole of this coupling and the clutch-withdrawing mechanism is contained within an oil-tight aluminum housing. The cone clutch also is inclosed. The encasing of the clutch-withdrawing mechanism was first introduced by Renault, and is a detail refinement which appears to be gaining ground.

Hotchkiss now carries the gearbox on the top of a couple of underswept transverse frame members. The foot brake has been increased in diameter and its face measures

COMPARISONS OF LEADING CONTINENTAL MOTORS AT PARIS SHOW

	1913		1914	
	Millimeters	Inches	Millimeters	Inches
Abadal	Not made		80x180 block T	3.14x7.08
Alcyon	75x120	2.95x4.72	65x120 block T	2.55x4.72
	80x130	3.14x5.11	75x120 block T	2.95x4.72
			85x130 block T	3.34x5.11
Alda	85x140	3.34x5.51	85x140 block L	3.34x5.51
Aquila Italiana	70x120	2.75x4.72	70x120 block head	2.95x4.72
	80x130	3.14x5.11	80x130 block head	3.14x5.11
Aries	65x100	2.55x3.93	65x100 block L	2.55x3.93
	75x140	2.95x5.51	75x140 block L	2.95x5.51
	84x130	3.30x5.11	84x130 block L	3.30x5.11
	101x130	3.97x5.11	90x150 block L	3.54x5.90
Austin	76x 89	2.99x3.50		
	89x127	3.50x5.00		
	110x153	4.33x6.02		
	89x115	3.50x4.52		
	110x127	4.33x5.00		
Barre	65x110	2.55x4.33	60x100 block L	2.36x3.93
	75x130	2.95x5.11	65x110 block L	2.55x4.33
	80x140	3.14x5.51	75x130 block L	2.95x5.11
	90x150	3.54x5.90	80x140 block L	3.14x5.51
			90x150 block L	3.54x5.90
Bazelaire	75x100	2.95x3.93	75x130 block L	2.92x5.11
	75x120	2.95x4.72	84x140	3.30x5.51
	84x130	3.30x5.11	85x120 block non-pop.	3.34x4.72
Bedella	76x 85	2.99x3.34	76x85 single	2.99x3.34
	80x100	3.14x3.93	80x100 single	3.14x3.93
	80x100	3.14x3.93	80x100 twin	3.14x3.93
Bellenger	80x130	3.14x5.11	80x130 pair Knight	3.14x5.11
	90x130	3.54x5.11	90x130 pair Knight	3.54x5.11
Benz	72x120	2.83x4.72	72x120 block L	2.83x4.72
	80x130	3.14x5.11	80x130 block L	3.14x5.11
	95x140	3.74x5.51	95x140 block L	3.74x5.51
	120x144	4.72x5.66	120x144 pairs L	4.72x5.66
	125x150	4.92x5.90	125x150 pairs L	4.92x5.90
	130x160	5.11x6.29	130x160 pairs head	5.35x6.29
	130x190	5.11x7.48	130x190 pairs head	5.11x7.48
	185x200	7.28x7.87	185x200 pairs head	7.28x7.87
Berliet	70x100	2.75x3.93	70x100 block L	2.75x3.93
	80x120	3.14x4.72	80x120 block L	3.14x4.72
	90x140	3.54x5.51	90x140 block L	3.54x5.51
	100x140	3.93x5.51	100x140 block L	3.93x5.51
	120x140	4.72x5.51	120x140 block L	4.72x5.51
Bollee	83x110	3.26x4.33	75x110 block L	2.95x4.33
	98x130	3.85x5.11	83x110 block L	3.26x4.33
			85x120 pairs L	2.34x4.72
Bozier	65x130	2.55x5.11	70x130 block L	2.75x5.11
	75x130	2.95x5.11	76x130 block L	2.99x5.11
	75x150	2.95x5.90	90x140 block L	3.54x5.51
Brasier	67x110	2.63x4.33	67x110 block L	2.63x4.33
	70x120	2.75x4.72	70x130 block L	2.75x5.11
	80x130	3.14x5.11	85x140 block L	3.34x5.51
	85x140	3.34x5.51	100x150 pairs L	3.93x5.90
	100x150	3.93x5.90		
Briscoe	Not made		67x 96 block L	2.63x3.77
Buchet	76x120	2.99x4.72	80x130 block L	3.14x5.11
	76x130	2.99x5.11	60x100 block L	2.36x3.93
	65x110	2.55x4.33	65x110 block L	2.55x4.33
	65x110	2.55x4.33	76x130 block L	2.99x5.11
Bugatti	65x110	2.55x4.33	65x110 block head	2.55x4.33
Buile (La)	65x130	2.55x5.11	75x150 block L	2.95x5.90
	70x150	2.75x5.90	80x160 block L	3.14x6.29
	80x160	3.14x6.29	90x160 block L	3.54x6.29
	90x160	3.54x6.29		
Charron	Not made		60x110 block L	2.36x4.33
	65x120	2.55x4.72	65x120 block L	2.55x4.72
	80x120	3.14x4.72	80x120 block L	3.14x4.72
	80x150	3.14x5.90	80x150 block L	3.14x5.90
Chenard & Walcker	65x120	2.55x4.72	65x120 block L	2.55x4.72
	70x130	2.75x5.11	70x130 block L	2.75x5.11
	75x150	2.95x5.90	75x150 block L	2.95x5.90
	80x150	3.14x5.90	80x150 block L	3.14x5.90
Clement-Bayard	60x120	2.36x4.72	60x120 block L	2.36x4.72
	65x120	2.55x4.72	65x120 block L	2.55x4.72
	75x110	2.95x4.33	80x130 pairs L	3.14x5.11
	75x130	2.95x5.11	90x140 pairs L	3.54x5.51
	80x130	3.14x5.11	90x140 block L	3.54x5.51
	90x140	3.54x5.51	100x140 pairs L	3.93x5.51
	80x130	3.14x5.11	90x130 pairs Knight	3.54x5.11
Corre La Licorne	Not made		60x100 block L	2.36x3.93
	65x130	2.55x5.11	65x130 block L	2.55x5.11
	75x120	2.95x4.72	75x120 block L	2.95x4.72
	75x150	2.95x5.90	75x150 block L	2.95x5.90
C. I. D. (Non-pop.)	75x120	2.95x4.72	75x120 block non-pop.	2.95x4.72
	95x150	3.74x5.90	80x140 block non-pop.	3.14x5.51
	80x140	3.14x5.51		
Cottin-Desgouttes	100x160	3.93x6.29	80x160 block L	3.14x6.29
	120x160	4.72x6.29	90x160 block L	3.54x6.29
	130x200	5.11x7.87	100x160 block L	3.93x6.29
Crespelle	65x110	2.55x4.33	65x110 block L	2.55x4.33
	68x130	2.67x5.11	68x130 block L	2.67x5.11
	75x120	2.95x4.72	75x120 block L	2.95x4.72
	75x150	2.95x5.90	80x150 block T	3.14x5.90
	80x150	3.14x5.90	80x180 block T	3.14x7.08
	80x180	3.14x7.08		
Daimler	80x130	3.14x5.11	90x130 pairs Knight	3.54x5.11
	90x130	3.54x5.11	110x130 pairs Knight	4.33x5.11
	101x140	3.97x5.51		
	124x130	4.88x5.11		
Darracq	68x120	2.67x4.72	75x120 block L	2.95x4.72
	75x120	2.95x4.72	85x130 block L	3.34x5.11
	80x130	3.14x5.11		
	100x140	3.93x5.51		
Delage	65x110	2.55x4.33	65x110 block L	2.55x4.33
	75x130	2.95x5.11	75x130 block L	2.95x5.11
Delahaye	62x100	2.44x3.93	62x100 block L	2.44x3.93
	65x120	2.55x4.72	65x120 block L	2.55x4.72
	90x130	3.54x5.11	75x130 block L	2.95x5.11
	75x110	2.95x4.33	80x130 block L	3.14x5.11
	75x130	2.95x5.11	85x130 block L	3.34x5.51
	85x130	3.34x5.11	95x140 block L	3.74x5.51
	95x140	3.74x5.51	110x150 block L	4.33x5.90
	110x150	4.33x5.90	130x150 block L	5.11x5.90

COMPARISONS OF LEADING CONTINENTAL MOTORS—Continued

	1913		1914	
	Millimeters	Inches	Millimeters	Inches
DeLaugere-Clayette	85x120	3.34x4.72	85x120 non-pop.	3.34x4.72
	90x140	3.54x5.51	85x120 block L	3.34x4.72
	100x140	3.93x5.51	75x120 block L	2.95x4.72
DeLaunay-Belleville	85x130	3.34x5.11	85x130 pairs L	3.34x5.11
	100x140	3.93x5.51	100x140 pairs L	3.93x5.51
Diatto	80x120	3.14x4.72	80x120 block L	3.14x4.72
De Dion Bouton	75x130	2.95x5.11	75x130 block L	2.95x5.11
	54x110	2.12x4.33	56x120 block L	2.20x4.72
	66x120	2.59x4.72	80x140 block L	3.14x5.51
	80x140	3.14x5.51		
	100x140	3.93x5.51		
D. F. P.	65x120	2.55x4.72	65x120 block L	2.55x4.72
	70x130	2.75x5.11	70x130 block L	2.75x5.11
	80x150	3.14x5.90	80x130 pairs L	3.14x5.11
Dumont	100x170	3.93x6.69	100x170 (single)	3.93x6.69
Espagnat	Not made		80x180 block T	3.14x7.08
F. N.	60x130	2.36x5.11	60x110 block L	2.36x4.33
	85x120	3.34x4.72	69x130 block L	2.71x5.11
	125x140	4.92x5.51	85x120 pairs T	3.34x4.72
Flat	70x120	2.75x4.72	70x120 block L	2.75x4.72
	80x140	3.14x5.51	80x140 block L	3.14x6.29
	100x140	3.93x5.51	100x140 block L	3.93x5.51
	110x150	4.33x5.90	110x150 block L	4.33x5.90
	130x170	5.11x6.69	130x170 block head	5.11x6.69
	130x190	5.11x7.48	130x190 block head	5.11x7.48
F. I. F.	75x120	2.95x4.72	75x120 block L	2.95x4.72
	75x130	2.95x5.11	75x150 block L	2.95x5.90
	75x150	2.95x5.90	65x110 block L	2.55x4.33
	65x110	2.55x4.33		
Forster	105x120	4.13x4.72	105x120 (single)	4.13x4.72
			65x100 block L	2.55x3.93
Gobron	75x150	2.95x5.90	75x150 block L	2.95x5.90
	90x180	3.54x7.08	80x160 pairs L	4.13x6.29
	110x250	4.33x9.84	100x200 pairs L	3.93x7.87
			110x250 pairs L	4.33x9.84
Gregoire	65x130	2.55x5.11	65x130 block L	2.55x5.11
	80x110	3.14x4.33	70x140 block T	2.75x5.51
	80x140	3.14x6.29	80x110 block L	3.14x4.33
	80x160	3.14x5.51	80x160 block L	3.14x6.29
Hespe (D. S. P. L.)	80x140	3.14x5.51	80x140 block L	3.14x5.51
Hispano-Suiza	80x110	3.14x4.33	80x130 block head	3.14x5.11
	80x130	3.14x5.11	90x150 block head	3.54x5.90
	80x180	3.14x7.08	80x180 block T	3.14x7.08
	100x150	3.93x5.90	100x180 block head	3.93x7.08
H. L.	75x120	2.95x4.72	76x130 block L	2.99x5.11
	80x150	3.14x5.90	80x150 block L	3.14x5.90
			80x130 block L	3.14x5.11
Hotchkiss	80x120	3.14x4.72	95x140 block L	3.74x5.51
	95x130	3.74x5.11	110x150 pairs L	4.33x5.90
Hurtu	70x110	2.75x4.33	70x110 block L	2.75x4.33
	75x120	2.95x4.72	75x120 block L	2.95x4.72
	90x120	3.54x4.72	90x120 pairs L	3.54x4.72
	105x130	4.13x5.11	105x130 pairs L	4.13x5.11
Isotta-Fraschini	75x130	2.95x5.11	75x130 block L	2.95x5.11
	85x130	3.34x5.11	85x130 block L	3.34x5.11
	100x140	3.93x5.51	100x140 block L	3.93x5.51
	110x160	4.33x6.29	120x160 block L	4.72x6.29
	105x180	4.13x7.08	105x180 block head	4.13x7.08
	130x200	5.11x7.87	130x200 block head	5.11x7.87
Labor	75x120	2.95x4.72	75x120 block L	2.95x4.72
	110x140	4.33x5.51	110x140 block T	4.33x5.51
Luxior	66x130	2.59x5.11	66x130 (2-cycle)	2.59x5.11
	75x100	2.95x3.93	75x100	2.95x3.93
	75x120	2.95x4.72	75x120	2.95x4.72
Majola	65x100	2.55x3.93	59x 90 block head	2.32x3.54
			65x100 block head	2.55x3.93
Martini	80x120	3.14x4.72	80x120 block L	3.14x4.72
	80x130	3.14x5.11	80x130 block L	3.14x5.11
	90x140	3.54x5.51	90x140 block head	3.54x5.51
Lancia	80x130	3.14x5.11	80x130 block L	3.14x5.11
	100x130	3.93x5.11	100x130 block L	3.93x5.11
	110x130	4.33x5.11	110x130 block L	4.33x5.11
	75x120	2.95x4.72	75x120 block L	2.95x4.72
Lorraine-Dietrich	90x130	3.54x5.11	80x130 block L	3.14x5.11
	125x170	4.92x6.69	90x130 block L	3.54x5.11
			95x160 block L	3.74x6.29
Mathis			125x170 pairs L	4.92x6.69
			58x100 block L	2.28x3.93
			65x100 block L	2.55x3.93
			70x120 block L	2.75x4.72
			90x135 block L	3.54x5.31
			100x140 block L	3.93x5.51
Mercedes	70x120	2.75x4.72	70x120 block L	2.75x4.72
	80x130	3.14x5.11	80x130 block L	3.14x5.11
	90x140	3.54x5.51	80x130 pairs Knight	3.14x5.11
	110x130	4.33x5.11	110x130 pairs L	4.33x5.11
	110x150	4.33x5.90	100x130 pairs Knight	3.93x5.11
	120x160	4.72x6.29		
	140x160	5.51x6.29		
	130x180	5.11x7.08		
Minerva	75x120	2.95x4.72	75x120 block L	2.95x4.72
	90x130	3.54x5.11	90x130 pairs Knight	3.54x5.11
	100x140	3.93x5.51	100x140 pairs Knight	3.93x5.51
	124x150	4.88x5.90	124x150 pairs Knight	4.88x5.90
Metallurgique	75x 96	2.95x3.77	75x 96 block L	2.95x3.77
	80x130	3.14x5.11	80x130 block L	3.14x5.11
	90x140	3.54x5.51	90x140 block L	3.54x5.51
	101x150	3.97x5.90	101x150 pairs L	3.97x5.90
	125x150	4.92x5.90	125x150 pairs L	4.92x5.90
Mors	75x120	2.95x4.72	75x120 block L	2.95x4.72
	85x150	3.34x5.90	85x150 block L	3.34x5.90
	75x150	2.95x5.90	75x120 block Knight	2.95x4.72
	(Knight) 90x130	3.54x5.11	90x130 pairs Knight	3.54x5.51
	(Knight) 100x140	3.93x5.11	100x140 pairs Knight	3.93x5.51
	(Knight) 124x150	4.88x5.90	124x150 pairs Knight	4.88x5.90
Motobloc	65x120	2.55x4.72	65x120 block L	2.55x4.72
	80x120	3.14x4.72	80x120 block L	3.14x4.72
	80x148	3.14x5.82	80x148 block L	3.14x5.82
	90x130	3.54x5.11		
Nagant	70x118	2.75x4.64	70x118 pairs L	2.75x4.64
	90x120	3.54x4.72	90x130 pairs L	3.54x5.11
	90x130	3.54x5.11	90x150 pairs L	3.54x5.90

3.5 inches. The shoes are external and ribbed. The equalizer for the rear brake forms a bevel gear differential in an aluminum housing. The adjustment is a very quick type, and on the main brake rod there is a coil spring within a tube to prevent abrupt application of the brakes. Braking effort is not exercised until this spring is compressed.

Rear springs are 2.5 inches in width on the big model and 1.9 inches on the small car. Their length is 56 inches in each case. Semi-elliptics are now used on all types; it is found that these not only give best riding qualities but enable the car to hold to the road better than with any other type. Drive and torque is taken care of through the springs. The number of leaves employed is generally fourteen.

Hotchkiss has produced a new rear axle built of two forged steel taper tubes bolted to a central horizontally divided aluminum housing. This type of axle is becoming the most extensively adopted for the higher grade cars, although the differential housing is as often of cast steel as of aluminum. Hotchkiss has made use of very thick walls for the housing with a view to deadening hum. The rear axle drive shafts are made taper in order to get a greater thickness of metal for the squared ends. The axle is of the floating type.

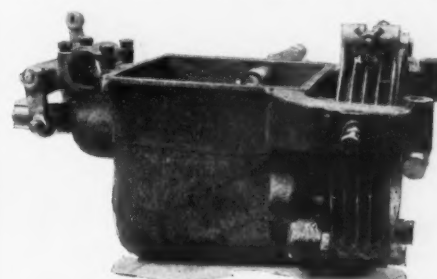
The electric lighting installation, which is fitted as standard, comprises a S. E. V. dynamo mounted across the front of the motor and driven by a cross shaft working from the camshaft pinion; skew gearing is used.

SIZAIRE-BERWICK.

Having severed all connection with the firm still bearing their name, the Sizaire Brothers are this year marketing a new car under the title Sizaire-Berwick. The Sizaires represent the engineering end, and Berwick the commercial department of the new concern. The car is a high grade production, orthodox in its general design, interesting in its details and closely following the Rolls-Royce so far as externals are concerned.

Intending to produce but one model, the Sizaires have decided on a four-cylinder L-type motor of 90 by 160 millimeters—3.5 by 6.29 inches—bore and stroke. This is a bit larger than the average-sized European motor. The valves and their operating mechanism form one of the features. Valves are very light, the stems being 8 millimeters thick; the heads are strongly domes, that is, pronounced mushroom type, the seats are bevel, and the valve stem is guided right up to the head. There is considerably more clearance in the upper portion of the guide than in the main portion.

By this design the exhaust gases strike the valve guide and not the stem; being protected in this way it is possible to make the valve lighter than would be permissible otherwise. The design brings the valves very close to the cylinder. The amount of offset of the cylinders is one-tenth the stroke. The pushrods are not guided. On the top of each one is fitted a steel cap



NEW DARRACQ GEARBOX WITH LARGE DIAMETER EXTERNAL RIBBED BRAKE

having a slightly hollowed out head to receive the end of the valve stem. Play is taken up by means of thin steel discs placed on the top of the pushrod, and within the sleeve mounted on it.

A light coil spring is mounted on the pushrod, and is in contact with a shoulder on it and with the bottom of the sleeve. This keeps the sleeve constantly in contact with the valve stem. Secured to the pin carrying the pushrod roller are a couple of arms attached at their outer end to an aluminum plate bolted on the face of the crankchamber just above the camshaft. The general design is shown in the drawing. It may be mentioned that this type of pushrod was adopted by Panhard on a small car produced last year.

Instead of a one-piece flywheel, the Sizaires have made this organ in three parts, each wheel being separately balanced, then the three bolted together. The gearbox, which is mounted on the same subframe as the motor, provides a combination of four speeds ahead. The shafts are in the vertical plane, very short, and hollow. The gear wheels, of BND steel, have a very short face width, in order to reduce noise and increase efficiency. It also is with a view to efficiency that light oil is made use of as a lubricant, in place of grease. The box is absolutely oil-tight, this result being obtained by cutting a coarse thread on the ends of the shafts in the contrary direction to their rotation. These have been found wonderfully effective in preventing oil losses; they are applied to the rear axle as well as to the gearbox. No felt washers are used.

Final drive is by propeller shaft and bevel gearing, the springs taking care of both the drive and the reaction. The rear axle is a fine construction formed of two taper tubes machined out of the solid forging and a cast steel differential housing divided horizontally. The axle is floating type. There are no tie rods. The driving pinion is supported both front and rear by double ball bearings. It is mounted in a separate steel housing cut away sufficiently to allow the engagement of the teeth, the entire unit being adjustable in the differential housing. The drive shafts are gently tapering, with a careful avoidance of any shoulder which might form a rupture point, and have a maximum diameter of 1.37 inches. There is a thrust bearing between the two halves of the driving shaft.

Springs are a very good feature. Those at the rear are mounted directly under the frame members, and under the axle. Width is 2.7 inches and length 57 inches. According to the type of body intended to be fitted, there are fifteen to twenty very thin leaves. This is entirely in accordance with the present European tendency, but the Sizaires appear to have been more generous under these headings than most manufacturers.

The braking surface also is very liberal. The drums measure 13.4 inches internal diameter by 1.65 inches in width. The brakes are all internal expanding, with aluminum shoes lined with Ferodo. The drums are forgings with machined out ribs to assist cooling. The rear wheel brakes are operated by the foot with steel cable connections.

The finish is electro plating throughout: radiator, levers, instruments, hub caps, greasers, etc. There is not a brass fitting on the car. The C. A. V. electric lighting plant is made a standard equipment and electric self-starter can be had if desired. Wheelbase is 136 inches and the frame has a depth of 5½ inches. There is a sharp kick-up over the rear axle, then a sweep down at the rear.

CHARRON

Charron is a good example of the attention being given to small cars by European manufacturers. By a small car is meant a four-

COMPARISONS OF LEADING CONTINENTAL MOTORS—Continued

	1913		1914	
	Millimeters	Inches	Millimeters	Inches
Panhard	90x150	3.54x5.90	95x160 pairs L	3.74x6.29
	106x130	4.17x5.11	106x130 pairs L	4.17x5.11
	106x150	4.17x5.90		
	70x140	2.75x5.51	70x140 block L	2.75x5.51
	80x120	3.14x4.72	80x120 block L	3.14x4.72
Peugeot	80x130	3.14x5.11	80x130 pairs Knight	3.14x5.11
	100x140	3.93x5.51	100x140 single Knight	3.93x5.51
	55x 90	2.16x3.54	55x 90 block T	2.16x3.54
	68x130	2.67x5.11	68x130 block V	2.67x5.11
	70x130	2.75x5.11	80x140 block L	3.14x5.51
Piccard-Pictet	80x140	3.14x5.51	95x160 pairs L	3.73x6.29
	95x160	3.74x6.29	115x180 pairs L	4.52x7.08
	80x120	3.14x4.72	80x140 pairs L	3.14x5.51
	80x140	3.14x5.51	90x170 pairs L	3.54x6.69
	90x150	3.54x5.90	85x130 pairs non-pop.	3.34x5.11
Pillain	90x170	3.54x6.69	100x150 pairs non-pop.	3.93x5.90
	100x150	3.93x5.90		
	55x110	2.16x4.33	55x110 block T	2.16x4.33
	65x120	2.55x4.72	80x140 block T	3.14x5.51
	75x110	2.95x4.33	100x140 block T	3.93x5.51
Pipe	90x120	3.54x4.72	110x180 block T	4.33x7.08
	85x185	3.34x7.28		
	100x140	3.93x5.51		
	124x140	4.88x5.51		
	75x110	2.95x4.33	75x120 block L	2.95x4.72
Ponette	75x120	2.95x4.72	80x150 block L	3.14x5.90
	80x130	3.14x5.11	100x180 pairs L	3.93x7.08
	90x140	3.54x5.51	120x200 pairs head	4.72x7.87
	100x160	3.93x6.29		
	130x160	5.11x6.29		
Porthos	80x130	3.14x5.11	65x100 block L	2.55x3.93
	90x140	3.54x5.51	70x130 block L	2.75x5.11
	100x160	3.93x6.29	90x130 block L	3.54x5.11
	130x160	5.11x6.29	75x120 block L	2.95x4.72
	80x130	3.14x5.11	80x130 pairs L	3.14x5.11
Renault	95x140	3.74x5.51	90x140 pairs L	3.54x5.51
	105x140	4.13x5.51	95x160 pairs L	3.74x6.29
	65x120	2.55x4.72	100x160 pairs L	3.93x6.29
	70x120	2.75x4.72	80x130 block L	3.14x5.11
	80x140	3.14x5.51	95x140 block L	3.74x5.51
Rochet-Schneider	105x140	4.13x5.51	110x140 block L	4.33x5.51
	65x120	2.55x4.72	65x120 block L	2.65x4.72
	70x120	2.75x4.72	70x120 block L	2.75x4.72
	80x140	3.14x5.51	80x140 block L	3.14x5.51
	105x150	4.13x5.90	90x140 block L	3.54x5.51
Rolland-Pilain	110x165	4.33x6.49		
			60x100 block L	2.36x3.93
			65x115 block L	2.55x4.48
			70x120 block L	2.75x4.72
			75x130 block L	2.95x5.11
Rolling			62x 80 block L	2.44x3.14
			65x110 block L	2.55x4.33
			70x100 block L	2.75x3.93
			80x120 block L	3.14x4.72
			90x140 block L	3.54x5.51
Ronteix			65x120 block L	2.55x4.72
			75x130 block L	2.95x5.11
			80x140 block L	3.14x5.51
			90x150 block L	3.54x5.90
			90x170 block L	3.54x6.69
Roy			69x130 pairs L	2.71x5.11
			80x140 pairs L	3.14x5.51
			85x140 pairs L	3.34x5.51
			70x120 block L	2.75x4.72
			75x130 block L	2.95x5.11
S. C. A. P.			80x140 block L	3.14x5.51
			95x140 block L	3.74x5.51
			110x160 block L	4.33x6.29
			90x160 block L	3.54x6.29
			65x120 block L	2.55x4.72
S. C. A. R.			75x120 block L	2.95x4.72
			75x130 block L	2.95x5.11
			80x140 block L	3.14x5.51
			95x140 block L	3.74x5.51
			110x160 block L	4.33x6.29
Schneider (Th.)			90x160 block L	3.54x6.29
			65x120 block L	2.55x4.72
			75x120 block L	2.95x4.72
			75x130 block L	2.95x5.11
			70x170 block T	2.75x6.69
Sizaire-Berwick			80x150 block L	3.14x5.90
			75x120 block L	2.95x4.72
			85x120 block L	3.34x4.72
			85x140 block L	3.34x5.51
			100x140 block L	3.93x5.51
Sizaire & Naudin			100x200 block L	3.93x7.87
S. P. A.				

cylinder model of less than 2¼ inches bore, light in construction, and intended for run-about or general touring purposes. The new Charron measures 2.3 by 4.3 inches bore and stroke. Its motor is a single casting conforming in general to the usual Charron practice, but having, among other distinctive features a special mounting on transverse tubes. These tubes, two in number, pass right through the front and the rear of the crankcase, and are secured to brackets on the frame members. The motor is free to slide on its tubes, and when centered it is locked in position by set screws. In order to take it out of the frame, there are only two bolts on each hanger to withdraw, allowing motor and tubes to be lifted clear away. Single-handed it ought to be possible to lift a motor entirely out of the frame in 15 to 20 minutes. No sod pan is fitted, but sheet metal guards are placed from side members to the crankcase giving complete protection against dust.

With a view to simplicity, the magneto is mounted on the front end of the crankshaft, and is just below the front transverse frame member. It is protected beneath by the sheet metal casing, which is swept down so as to encircle it, and the front is covered by the license plate. By taking out one screw, the license plate swings down leaving the contact-breaker of the magneto fully accessible. With this design there are but two pinions in the motor; the crankshaft and the camshaft pinions, united by a silent chain. The starting handle passes through the front cross frame member and engages with the end of the camshaft. Wiring also is simplified for it passes in a straight line from the magneto to the plugs. The clean-cut appearance is further enhanced by having the water inlet pipe behind the cylinder block going direct to the dashboard radiator, instead of running along one side of the casting, as is usual. The exhaust manifold is separate, but the carbureter is bolted up

COMPARISONS OF LEADING CONTINENTAL MOTORS—Concluded

	1913		1914	
	Millimeters	Inches	Millimeters	Inches
Stabilia	75x120	2.95x4.72	75x120 block L	2.95x4.72
	75x150	2.95x5.90	75x150 block L	2.95x5.90
	80x150	3.14x5.90	80x150 block L	3.14x5.90
Sunbeam	90x160	3.54x6.29	80x150 block L	3.14x5.90
			90x160 block L	3.54x6.29
Turcat-Mery	80x130	3.14x5.11	80x130 block L	3.14x5.11
	90x130	3.54x5.11	90x130 block L	3.54x5.11
	110x130	4.33x5.11	90x140 block L	3.54x5.11
	100x150	3.93x5.90	100x150 block L	3.93x5.90
	110x160	4.33x6.29	110x160 block L	4.33x6.29
Unic	65x110	2.55x4.33	65x110 block L	2.55x4.33
	75x120	2.95x4.72	80x130 block L	3.14x5.11
	90x130	3.54x5.11	90x130 block L	3.54x5.11
Vermorel	66x110	2.59x4.33	66x110	2.59x4.33
	74x120	2.91x4.72	74x120	2.91x4.72
	90x130	3.54x5.11	75x130	2.95x5.11
Vinot-Deguingand	70x110	2.75x4.33	70x110 block L	2.75x4.33
	80x110	3.14x4.33	80x110 block L	3.14x4.33
	80x130	3.14x5.11	80x130 block L	3.14x5.11
	95x130	3.74x5.11	85x130 pairs L	3.34x5.11
	101x130	3.97x5.11	100x150 pairs L	3.93x5.90
Biolet-Bogey	Not made		73x130 2-cyl. L	2.87x5.11
Vauxhall	90x120	3.54x4.72	90x120 block L	3.54x4.72
	95x140	3.74x5.51	95x140 block L	3.74x5.51
Wolsley	90x121	3.54x4.76	90x121 pairs L	3.54x4.76
	90x130	3.54x5.11		
	114x146	4.48x5.74		
Zedel	72x120	2.83x4.72	72x120 block L	2.83x4.72
	90x140	3.54x5.51	75x120 block L	2.95x4.72
			90x140 block L	3.54x5.51

COMPARISON OF CONTINENTAL SIX AND EIGHT-CYLINDER CARS AT PARIS
SIX-CYLINDER

Aquila-Italiana	80x130	3.14x5.11	80x130 block head	3.14x5.11
Aries	75x120	2.95x4.72	Withdrawn	
Bazelaire	75x120	2.95x4.72	Withdrawn	
Bollee	83x110	3.26x4.33	83x110 pairs L	3.26x4.33
Brasier	90x140	3.54x5.51	90x140 block L	3.54x5.51
Buile (La)	85x140	3.34x5.51	85x140 block L	3.34x5.51
Charron	80x120	3.14x4.72	Withdrawn	
	95x130	3.74x5.11	95x130 threes L	3.74x5.11
Chenard & Walcker	80x150	3.14x5.90	Withdrawn	
Clement-Bayard	70x110	2.75x4.33	Withdrawn	
	80x120	3.14x4.72	Withdrawn	
Darracq	85x120	3.34x4.72	Withdrawn	
Delage	65x130	2.55x5.11	65x130 block L	2.55x5.11
Delahaye	75x120	2.95x4.72	75x120 block V	2.95x4.72
Delannay-Belleville	75x120	2.95x4.72	78x140 threes L	3.07x5.51
	85x130	3.34x5.11	88x150 threes L	3.46x5.90
	100x140	3.93x5.51	103x160 threes L	4.05x6.29
			85x130 threes L	3.34x5.11
			100x140 threes L	3.93x5.51
D. F. P.	80x130	3.14x5.11	Withdrawn	
Fiat	80x130	3.14x5.11	Withdrawn	
Hotchkiss	95x130	3.74x5.11	Withdrawn	
Hudson			89x127 threes L	3.50x5.00
Motobloc			105x133 threes L	4.13x5.23
Packard			80x120 block L	3.14x4.72
			100x140 threes L	3.93x5.51
			115x140 threes L	4.52x5.51
Mercedes	120x150	4.72x5.90	Withdrawn	
Panhard	100x140	3.93x5.51	90x130 sep. Knight	3.54x5.11
			100x140 sep. Knight	3.93x5.51
Pilain	65x120	2.55x4.72	65x130 block L	2.55x5.11
Renault	80x140	3.14x5.51	85x150 threes L	3.34x5.90
	100x160	3.93x6.29	100x160 threes L	3.93x6.29
Roy	80x120	3.14x4.72	Withdrawn	
Schneider (Th)	75x130	2.95x5.11	Withdrawn	
Rolls-Royce	114x121	4.48x4.76	114x121 threes L	4.48x4.76

EIGHT-CYLINDER CARS

De Dion Bouton	70x130	2.75x5.11	66x130 blocks L	2.59x5.11
	90x140	3.54x5.51	75x130 blocks L	2.95x5.11
			94x140 blocks L	3.70x5.51

direct to the cylinder casting on the valve side. Valves stems are inclosed.

The gearbox has a similar mounting to that for the motor. It is of the three-speed straight-through type, with two neutral points, one being between reverse and first, and another between second and third. This is done to allow the driver to pass direct into neutral, and also to get away on second under suitable circumstances without going right through the range of gear changes. There is nothing distinctive in the rear axle, which is floating type with drive shaft in a torque tube. Both sets of brakes are side by side in the road wheels. Diameter of the drum is 12 inches, a big size for a car of this power and weight.

Charron has a somewhat similar model of 2.5 by 4.7 inches bore and stroke, and a medium car of 3.1 by 4.7 inches bore and stroke. This latter differs by reason of three point suspension of motor—two rear arms carried on the frame members, and a

trunnion in front. The motor has a three-bearing crankshaft, whereas the others have two bearings only. The magneto is set alongside the motor on a sliding platform allowing of chain adjustment. A single chain is used for driving cam and magneto shafts. The gearbox is also three-point suspended, and final drive is the same as on the smaller cars.

A change has been made in the lubrication system. A plunger pump driven by cam from the camshaft, delivers oil to a collector within the crank-chamber, from which it flows directly into constant level troughs immediately under the second and third connecting rods. The oil splashed out of the central troughs is gathered on two long inclined oil leads cast on the inner wall of the crank-chamber, and led by them to troughs under No. 1 and 4 connecting rods. There are similar oil collectors for the main bearings. Formerly a drip feed, interconnected with the throttle, was made use of.

Electric lighting is not included as a standard equipment on any of the Charron models, but provision is made for it on all but the smallest.

When a dynamo is fitted the cover on the timing gear housing is changed for a special one carrying a pinion obtaining its drive from the magneto shaft pinion. The dynamo platform is alongside the crankshaft on the left-hand and is made to receive most of the makes on the European market. Similar arrangements are made for receiving an electric motor alongside the gearbox, with chain drive to the clutch shaft.

Charron completes the series with a four-cylinder monoblock of 3.3 by 5.9 inches bore and stroke, a four-cylinder in pairs of 4.3 by 5.9, and a six in three groups of 3.7 by 5.1. The greatest output is of the smaller models.

ABADAL

Atadal is a newcomer popularly placed in the sporting class, for the motor is high-efficiency type with four monoblock cylinders of 80 by 180 millimeters—(3.1 by 7.08 inches)—bore and stroke. Originally adopted by Hispano-Suiza, these dimensions have been copied by several makers; the stroke-bore ratio, 2.25 to 1, is above the average, being the highest adopted on a standard touring model. The interchangeable valves are inclined outwards 8 degrees from the vertical with a view to improving the form of the combustion chamber. The motor is remarkably short, but the crankshaft is carried on three plain bearings.

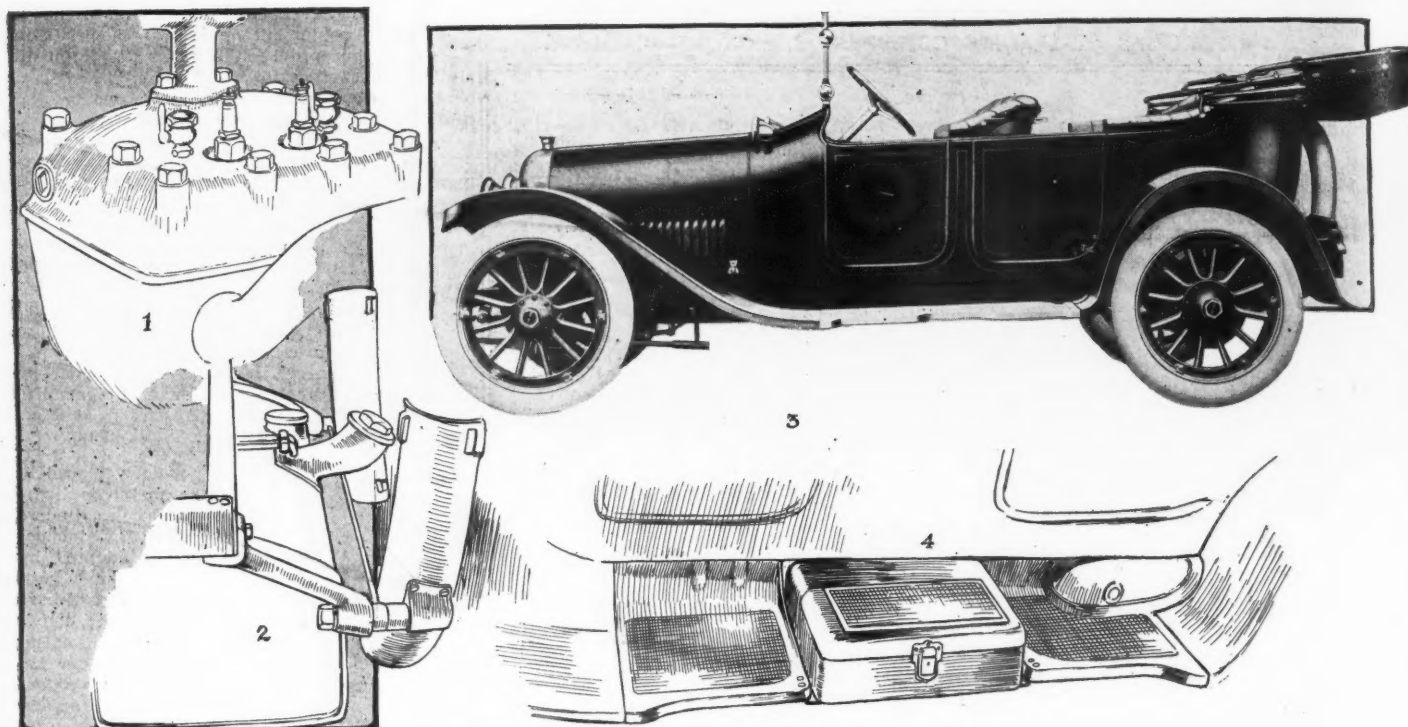
A particularly large quantity of lubricating oil is carried, the base chamber having a very big circular sump with a detachable bottom. Oil is delivered to all bearings, including wrist pins, at a high pressure. The motor and gearset are individual units bolted together and mounted on the frame members so as to stiffen this latter. The design is what is termed an armoured construction. A V-type radiator is used, the quantity of water in circulation being 7 gallons.

The rear axle is a bevel type built up of taper tubes and a cast steel differential housing divided horizontally. The broad semi-elliptic springs are relied on to take the drive and the reaction. All brakes are internal expanding, the foot brake being ribbed.

UNIC

Unic (George Richard) has produced a new four-cylinder model of 80 by 130 millimeters—3.1 by 5.1 inches—bore and stroke. This firm's output consists almost entirely of four-cylinder types. There is a six-cylinder model on the catalog, but it is more in evidence there than anywhere else. The new four is distinctive by having a two-bearing crankshaft. For motors of this size the majority of French designers seem to prefer a central bearing, but Unic, which always has shown a preference for two bearings only, has got over the objections of vibration and whip by making the block unusually compact and fitting a main shaft of 1.96 inches diameter. The intake manifold is a part of the cylinder casting, with the carburetor on the valve side. The exhaust manifold is independent and is ribbed, being bolted up so close to the cylinder group as to give the impression of being part of the casting. Timing gears are chain-driven, two chains being employed. One of these runs from mainshaft to camshaft, and the other from camshaft to shaft driving magneto and water pump. On the former there is no adjustment; on the latter adjustment is made by means of an idler pinion.

Lubrication is under pressure to seven points—main bearings, connecting rod bearings and chains—the change being an increase to 1.3 gallons of lubricating oil in the base chamber.



SOME REFINEMENTS TO BE FOUND ON 1914 OAKLAND CARS

1—Removable cylinder heads on new Oakland 6-48. One head for each two cylinders is held in place by nine bolts; 2—New form of tire carrier for the coming year; 3—New six-cylinder 6-48 Oakland; 4—Type of running board used on the model 43

New and Smaller Six Added to the Oakland Line

Model 35 Four Continued, Model 42 Changed

BESIDES continuing its 1913 model 35 four-cylinder car, the Oakland Motor Car Co., Pontiac, Mich., has added for 1913 a brand new smaller six and has changed its larger four, model 42, principally by the use of a large motor, now calling the car model 43.

With a motor of $3\frac{1}{2}$ inches bore and 5 inches stroke, the new little six, designated as model 48, enters upon its career equipped similarly to the smaller four in so far as cylinder dimensions and general power plant design are concerned, necessary differences due to the two extra cylinders coming in, of course. Model 43 has a $4\frac{1}{4}$ by $5\frac{1}{4}$ -inch motor, whereas the corresponding model of 42 of last year was provided with an engine of $4\frac{1}{8}$ bore and $4\frac{3}{4}$ -inch stroke. This increase of $\frac{1}{8}$ inch in the cylinder diameter, together with the lengthening of the stroke by $\frac{1}{2}$ inch, obviously adds greatly to the power of the car.

Prices Include Equipment

In cataloging these cars with full equipment, the Oakland company changes from its former policy of listing the equipment extra. Prices are quoted with full equipment, including Delco combined lighting, cranking and ignition on all models. For model 35, \$1,200 is asked in standard touring car design, while for the roadster of the same model \$50 less is quoted. Models 43 and 48 command identically the same figure of \$1,785 in standard body types. Special bodies in the shape of a

cabriolet, a coupe and a sedan, are listed at higher figures.

The model 43 maintains the same general outward appearance that it had last year, although the new light six is of true stream line type with a rounded radiator and sloping, rounded-top hood which meets the sloping cowl. This latter in turn rounds out into the body in unbroken line. In fact, the line is unbroken from the front of the radiator to the back of the body, a shape which offers the least wind resistance when the car

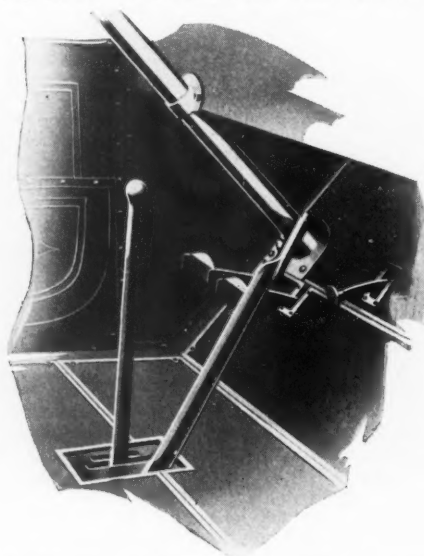
travels at high speed. This feature checks up with the intents and purposes of the term streamline as applied to the motor car. Like this new six, the model 35 is also provided with a streamline dress of somewhat different style.

The characteristic Oakland V-shaped radiators with German silver tops are continued on the two fours in the same design as used last year. To meet the requirements of the rounded hood, the radiator of the model 48 is rounded at the top but in other respects it conforms to the same V design.

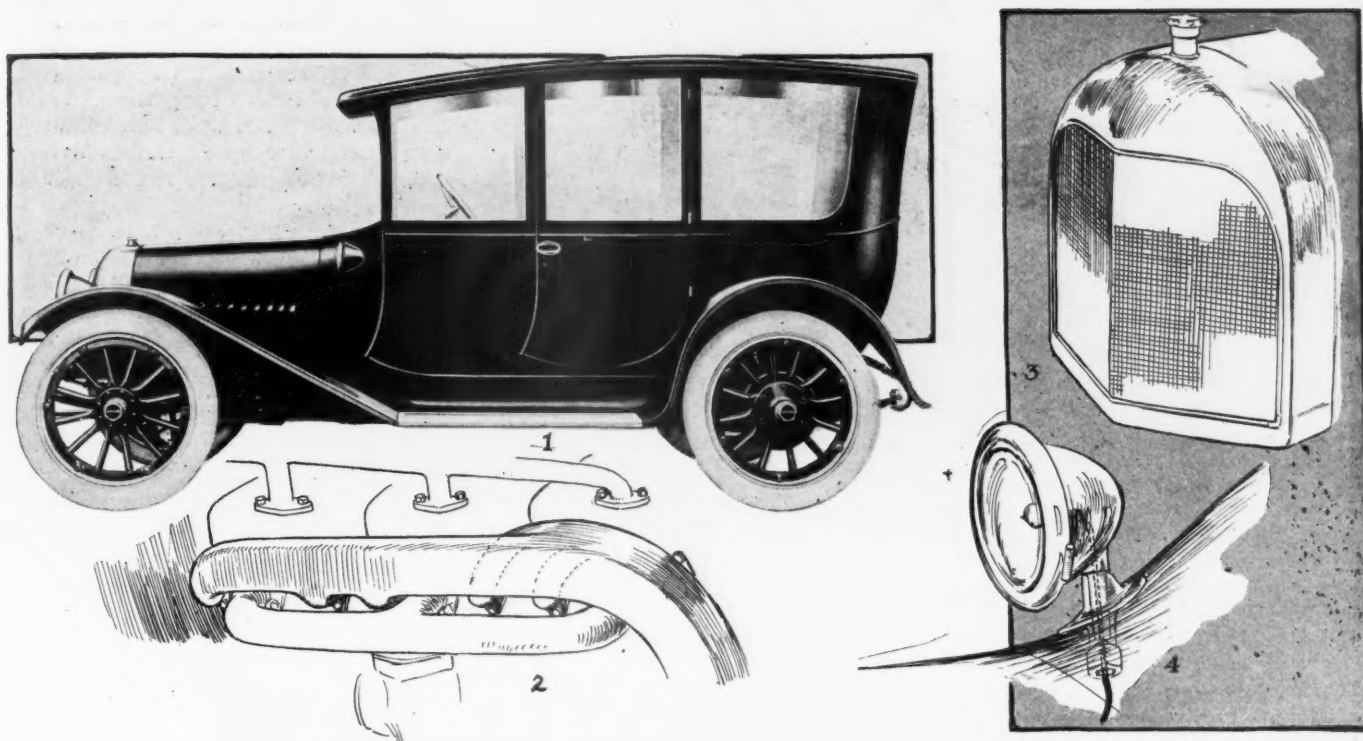
Much attention has been paid to the refining of the smaller details of the bodies—points which do not appear on the surface but which have much to do with the comfort of the passengers and the appearance. The new line is easily the finest that ever has gone out from the Oakland factory.

Double-Step Running Board Dropped

As a body feature the double-step, non-continuous running board has been discontinued. The new light six has cast aluminum running boards of a very distinctive appearance. The model 43 is equipped with a shallow box for tools or other articles on either side between the cast aluminum steps which are of modified design over last season's. Thus the running boards of this car are virtually continuous. This tool box idea gets away from the box on the running boards which was so prevalent in cars of the past, but



OAKLAND LEFT DRIVE AND CENTER CONTROL



ADDITIONAL FEATURES OF THE OAKLAND LINE FOR THE COMING YEAR

1—The model 43 sedan showing the large windows and original body lines; 2—New double exhaust manifold passing above the intake header; 3—The 6-48 rounded-top, V-shaped radiator; 4—New type of Oakland sidelight with no wires exposed

at the same time gives additional carrying space.

Although right drive and control were used consistently throughout the entire Oakland line for 1913, the concern has recognized the popular demand among at least a part of the motor public and to meet it has shifted to left drive and center control on all models except model 43, which remains as it was.

All Oakland Motors Alike

Motors of the Oaklands are built for these cars by the Northway Motor Mfg. Co., Detroit, which, like the Oakland company, is a part of the General Motors organization. Hence the same design tendencies are to be found in all of the power plants. They are of the L-head unit-constructed type and suspended from the frame at three points. Flywheel, clutch and gearset are housed integrally, the gearbox portion bolting through a flange to the rear of the crankcase. Valves are on the left.

The light six power plant dimensions correspond, wherever consistent, with those of the model 35 engine. Cylinders are cast in a block and integral with the upper half of the crankcase. The six has four main crankshaft bearings which are of ample size. The camshafts are drop-forged with the cams integral. Both generator and camshafts are driven by spiral gears. Connecting rods also are drop-forged, of special alloy steel and heat-treated.

Pistons are made of cast iron, ground to size and fitted with three ground eccentric piston rings each. These pistons are built as light as possible in order to

give the least vibration to the motor when running at high speed. Since the pistons are electrically-treated before grinding, internal strains in the castings are relieved and the pistons are thus insured against warping. The model 48 motor has an exhaust manifold of the double-way type, which is necessary in order to prevent the exhaust from one cylinder entering another on account of two exhaust valves being open at the same time. The cylinders at the end of exhaust stroke will be practically free from gases and the capacity of the following inlet charge will not be affected by the burned gases of the previous explosion stroke.

Advantage of Double Manifold

It is claimed for this double exhaust manifold construction that it also prevents heating and carbonizing of the exhaust valves, as two successive explosions never pass by the same valve opening. This double construction obviously is not necessary with four-cylinder engines

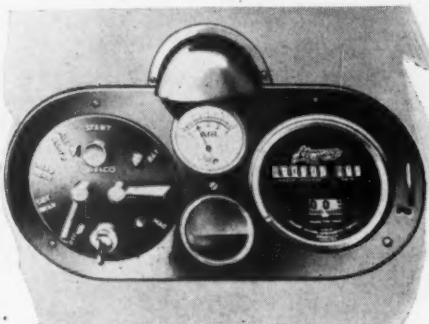
where there is no overlap of the valve openings.

The inlet manifolds also are of special Oakland design. Great care has been taken to cut down resistance and to give all cylinders an equal amount of gas. On model 48 the throttle shaft has been arranged parallel with the center line of the car, at right angles to the conventional way of mounting. Consequently, the throttle valve which, according to Oakland engineers, generally acts as a deflector and which, by the generally adopted construction, tends to throw the gases toward one end of the motor, will as arranged on the Oakland six, distribute the inlet gases equally to each cylinder.

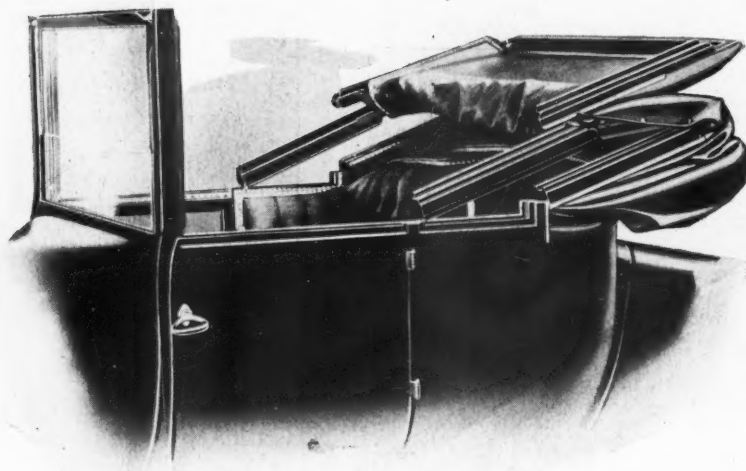
A special feature of the new six engine is the removable cylinder head construction. Each two cylinders are capped with a head which is held down by nine holding bolts. The spark plugs, priming cups and connection to the water manifold are taken care of by these heads. The construction makes it an easy matter to get at the tops of the pistons and the cylinder walls. This removable head construction also is employed on the model 35 engine this year.

Lubrication of the Motor

The oiling system is unchanged, although the adjustment for the stroke of the oil pump has been made more accessible and by turning a nut the amount of oil may be regulated. The lubrication is by splash with circulation maintained by the cam-operated plunger pump. Below each connecting rod there is an oil trough into which the end of the rod dips, splashing the oil to the bearings and into the



DASH VIEW 6-48 OAKLAND SHOWING CENTRALIZATION OF INSTRUMENTS



OAKLAND CABRIOLET WITH TOP DOWN

cylinders. The lubricant eventually runs into a sump in the lower part of the crankcase from which point it is returned to the troughs and timing gears by the pump.

The Delco combination cranking motor, generator and ignition device is located at the right rear side of the engine so as to be near the flywheel, to which its gears mesh when performing the cranking function. As a generator and magneto, it is driven from the same shaft which drives the water pump. The distributor, however, is separate from the main electrical unit and occupies a position on the left front of the engine where it is driven by a vertical shaft connected with the timing gearing.

Delco Electric System Employed

A special starting pedal has been provided on the toe board and with the system as now used the cranking speed has been increased fully 50 per cent. The motors are turned over at about 130 revolutions a minute. Of course much depends upon the stiffness of the motor in question. The new Delco system as used by the Oaklands is of the 6-volt type, with a single wire and grounded return plan, making a very simple pattern.

Exide storage batteries are used with these electrical systems on the Oakland cars, the capacity for the small car being 80 ampere-hours, while the six and the model 43 use a 100 ampere-hour type. The gear reduction between the engine and the motor when in position for cranking is about 25 to 1, while as a generator the unit is driven at engine speed on the fours and at 1.5 engine speed for the six. Suitable cutout switches prevent the overcharging of the storage battery and project the apparatus against short circuits.

As already mentioned, the ignition apparatus has been separated from the motor generator.

Setting of the spark is accomplished by unscrewing a nut in the center of the distributor shaft after unclasping the cover of the distributor. A feature of the Delco system for 1914 is the equipping of a voltage regulator which allows the generator to charge at a higher rate when the battery is low on account of undue cranking or after leaving the lights burning all night. It is stated that this voltage regulator will, under all conditions, keep the battery fully charged. The storage battery is carried under the front seat on all models with the exception of model 43 on which the 1913 mounting on the right front fender is retained.

All features of the larger four-cylinder motor used in model 43 are consistently uniform with those of the other two except that the cylinders are cast in pairs, have integral heads and bolt to the aluminum crankcase, which is horizontally split into an upper and lower portion in the usual way. This engine's dimensions are different than those of the 35 and 48, as will be noted by a perusal of the dimension table appended.

Standardization of Chassis

So far as possible the chassis design of all models has been standardized. The clutch used is a leather-faced cone type with spring inserts underneath. The gear-

set of the Oaklands is a three-speed, selective type, and on the new 48 a special control lever assembly has been designed to bolt to the rear of the gearbox. There are four bolts, which when removed allow the control levers to be removed together with the shifting H-gate and emergency brake ratchet.

Models 48 and 43 drive back to their rear axles through an uninclosed drive shaft, parallel to which a well-designed torque arm runs. The shaft is fitted with two universal joints, while the front end of the torque arm is supported by a cushion spring in order to save the rear axle gears from sudden stresses. On the new six, this front spring of the torque arm sits on top of the frame cross member and is provided with a grease cup to lubricate the hinge portion. The drive is taken by the front ends of the lower halves of the three-quarter elliptic rear springs.

Model 35's propeller shaft is inclosed within a torque tube and has a single universal joint at its front end.

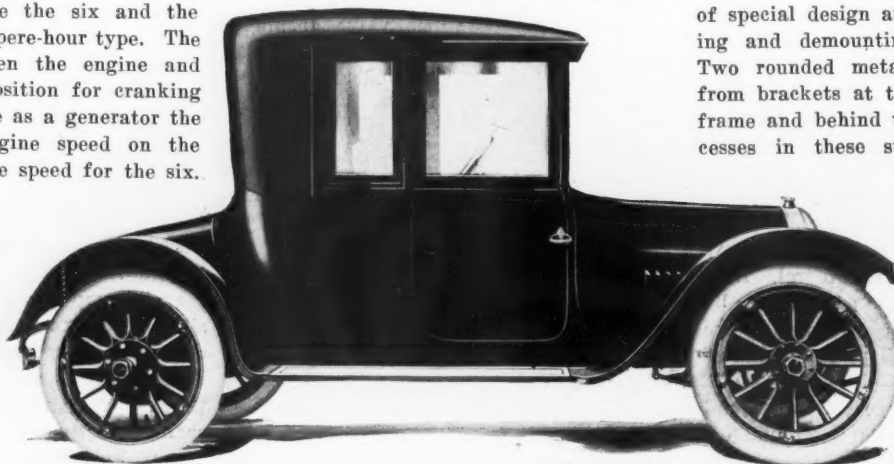
Axles on Six

The six and the lighter four have semi-floating rear axles, while the 43 is equipped with a floating type. All have conventional bevel ring gears and pinions and differentials. Nickel steel plays an important part in this rear unit. Brakes expand internally and contract externally, model 43's service brakes acting in the former manner and the emergency in the latter. With the other two cars the reverse is true. The brakes are fitted with an easy and accessible adjustment device on the rear axle which does away with the usual method of adjusting by lengthening the brake rods. A single turn of a hand wheel, located on the rear axle, takes care of the brake wear.

All the 1914 cars have the gasoline tank at the rear feeding to the carburetor by pressure. The tanks have gauges and large filler caps, while a new design of air pump gives the necessary pressure on the fuel. This pump has a relief to provide any desired pressure, the recommended amount being 2 pounds per square inch.

Tire carriers on the new Oaklands are of special design and permit easy mounting and demounting of the spare tire. Two rounded metal pieces are fastened from brackets at the rear corners of the frame and behind the gasoline tank. Recesses in these strips take the straps which hold the tire in place. These are said to prevent chafing of the tire.

Wheelbases of the two fours remain unchanged at 112 inches for the 35 and 116 inches for the 43. The new light six has a wheelbase of 123½ inches.



CABRIOLET MODEL WITH TOP IN PLACE

Mitchell Cars Have Minor Changes

European Design Continued but Better Adapted to American Needs

THERE has been a number of important improvements in the details of Mitchell cars for 1914, although the distinctive design which characterized the 1913 product of the Mitchell-Lewis Motor Co., Racine, Wis., remains the same. The same three chassis models are retained and continue to be essentially of European engineering practice in the main points of their design, an innovation that was introduced in the 1913 Mitchells. The modifications occur in a few minor respects to suit the cars more completely to the demands of the American user and the exigencies of American roads.

As in the 1913 product, the line will consist of a four-cylinder car, a light six and a big six. The four-cylinder has a $4\frac{1}{4}$ inches bore and 7 inches stroke, a 120-inch wheelbase and 36 by $4\frac{1}{2}$ -inch tires. Upon it are fitted two, four and five-passenger bodies, listed at \$1,595. This is an increase in price of \$95.

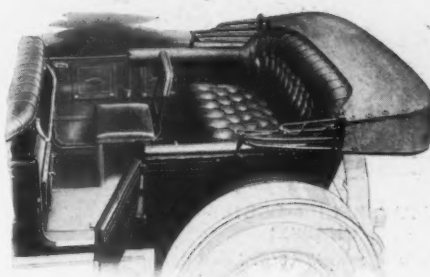
The little six has a motor of $4\frac{1}{4}$ by 6 inches cylinder dimensions, although the big six motor, $4\frac{1}{4}$ by 7 inches, may be installed if desired. The wheelbase is 132 inches and tires and bodies are the same as in the four and the completed car listed at \$1,895 with an option of a seven-passenger body at \$1,995. As compared with last year's prices the little six is \$45 higher.

The big six car with its $4\frac{1}{4}$ by 7-inch motor, 144-inch wheelbase and 37 by 5-inch tires carries a seven-passenger body only and is listed at \$2,350 a reduction of \$150 from the 1913 product.

General Features Alike

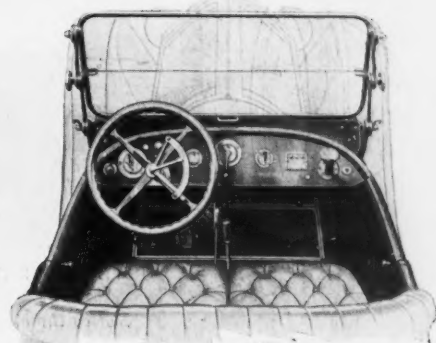
General features of the chassis are alike throughout the three models except in size and number of cylinders and the wheelbase. The motors are of the same design. All are T-head motors cast in pairs. All the power plants are carried in a sub-frame which is supported at three points. From the motor back the cars are the same except the lengthening of the frame, and the greater length of the transmission shaft. The design includes a cone clutch, a very strong frame braced by three exceptionally wide cross-members near its center, a massive ball thrust mounting at the front end of the torsion tube, a floating rear axle seven-eighth elliptic springs, left drive and center control.

Considering first the 1914 motors, both cylinder and crankcase casting have undergone considerable alteration. The chambers in which the valve elements are housed are



TONNEAU OF MITCHELL SEVEN-PASSENGER CARS

Showing how the extra seats disappear into front seat. One is shown open and the other closed



FORWARD COMPARTMENT OF MITCHELLS FOR 1914

The arrangement of the instruments on the cowl board is illustrated as is the left drive and center control

FEATURES OF 1914 MITCHELLS

Three chassis models, two sixes and a four

Four and larger six have cylinders $4\frac{1}{4}$ by 7 inches

Little six has a motor $4\frac{1}{4}$ by 6 inches in size

T-head long-stroke motor on all Motors are much lighter than formerly

Wheelbases are 144, 132 and 120 inches on big six, little six and four, respectively

Left drive, center control

Remy electric system

Floating rear axle

Seven-eighths elliptic springs

Rain-vision, ventilating windshield, built into dash

Magnetic exploring lamp

Demountable rims

Collins' quick-action curtains

made much shallower so that they are closed now by curved instead of by the previous flat stamped-steel covers. This has been found to increase materially the accessibility of push-rod adjustments and, in combination with other refinements in the form of the casting confers the additional advantage of lightening the motor by not less than 200 pounds while in nowise detracting from its sturdiness.

Lubrication of the motor involves little more than the combination of a plunger pump in the sump with a pipe and channel through which the oil is distributed

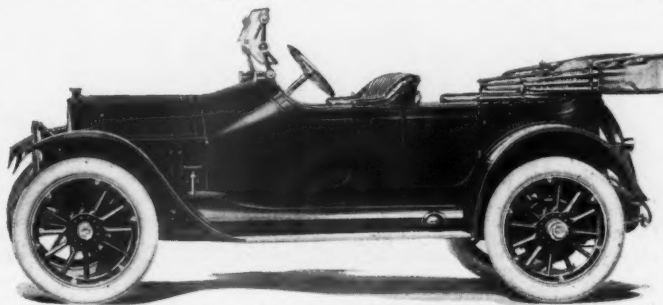
to the crankshaft and other bearings. Oil is led to the timing gears at two points through outside pipes. The oil pump is gear-driven from the camshaft. Felt washer and drains at the end bearings prevent leakage from the crankcase.

The six-cylinder is now supported by six arms which are cast as a part of the crankcase and rest upon a U-shaped channel sub-frame, which at the rear of the U rests at two points on a stamped cross-member of the main frame. The front of the sub-frame is supported at the center of the front cross-member of the main frame, in this case a stout forging. There is thus provided a three-point system of support, though the three points of support are not directly on the motor itself.

Exceptionally Large Valves

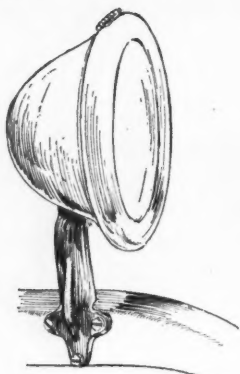
Mitchell valves all are interchangeable. The valve diameter is over half that of the cylinder-bore and affords a freedom of flow that results in the development of considerably more power than might be expected from the cylinder dimensions. Valve springs are exceptionally long and large in diameter so that they do not lose their tension readily. The springs are held in place by cupped washers and U-shaped retainers instead of the notched-keys used in 1913, the change being made to render them a little more convenient to manipulate. The tops of Mitchell pistons are now made flat instead of cupped. This change is due to the belief that with a deeply cupped piston, the larger piston area thus exposed to the heat more than offsets the slight advantages accruing from the spherical combustion chamber.

The timing gearcase has been redesigned completely. All the gears are cut with helical teeth for quietness, and eccentric bearings on the camshaft, generator shaft and magneto shaft provide for wear between the gears. Besides this the idler gear between the crankshaft and camshaft gears is so arranged that it may be centered to distribute backlash. The four-bladed fan is now driven



MITCHELL FOUR-CYLINDER TOURING CAR

The smooth lines of the body may be seen and the streamline effect is apparent



MITCHELL HEADLIGHT

The pedestal is a patented feature; it is very heavy and the wiring is carried through the frame horns and pedestal so that none is exposed

previously, thus making for simplicity.

The Rayfield carburetor now is mounted closer to the manifold so that it is higher and more accessible than heretofore and also there is less condensation.

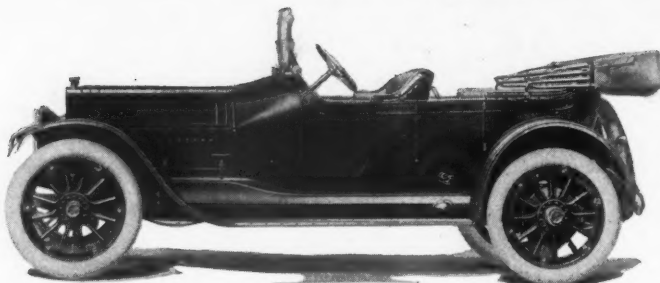
Ignition is obtained from a Remy high-tension magneto with a lighting and starting battery as reserve. The magneto is mounted on the left side of the engine and is driven through a flexible universal from the timing gear box. A fiber distribution tube is employed and all of the secondary wires are marked at both ends while the firing order of the cylinders is indicated on a plate mounted on the distribution tube. For starting the motor on the spark a vibrator is switched into the circuit but at other times the vibrator is not in use.

To furnish the power for cranking a Remy ball-bearing, 6-volt motor is used. It is located beside the gearbox and the drive is into a gear on the mainshaft in front of the gearbox. Engagement is effected by foot pedal actuating a sliding gear and, at the same time, making the proper electrical connections.

The Cranking Motor

The motor is geared to the engine at 25 to 1. As soon as the engine gets under way, a free wheel clutch allows it to overrun the starting motor so that neither the gears nor the armature can be damaged by over-speeding. The current for keeping the battery charged is supplied from a separate Remy generator mounted on the exhaust side of the engine and driven from the timing gears. The compactness of the whole starting apparatus will be realized from the fact that the cranking motor weighs only 35 pounds. In connection with the lighting system the Mitchell company is considering plans for the elimination of the side lamps with the probability that, if the American demand accepts this innovation, headlights for the 1914 models will have double bulbs, the larger for country running and the smaller for city use.

Of transmission changes there are several in the new models. Commencing with the clutch cone, this is now a steel stamping in place of an aluminum casting em-



FIVE AND SEVEN-PASSENGER BODIES ON SIX-CYLINDER CHASSIS

Notice the clear lines of running board and apron on this car

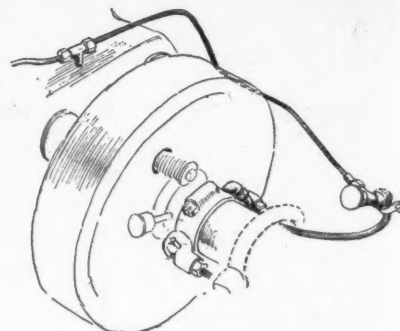
by an endless canvas belt with adjustable tension, superseding the gear drive for the fan used

previously. In the gearbox the shafts through the sliding gears are now squared instead of splined. The cross members of the frame which support the gearbox are now curved upwardly instead of downwardly, allowing the whole change-speed mechanism to be dropped out of place without removing the body. The gearbox is somewhat smaller than heretofore though the jointless leak-proof construction is retained. The universals in the driving shaft back of the gearbox are splined into place to facilitate easy removal. The ball thrust mounting on the front end of the torsion tube is retained but the frame cross-member in which it is carried is deeper and more heavily webbed.

Floating Axle Design

Rear axle construction has been modified considerably in the respect to lightness, simplicity and accessibility. The differential now can be inspected through a large, removable cast aluminum cover and the drive to the wheels is now of the floating type, the wheels running on the axle housing and being driven by jaw clutches. Taper roller bearings are used in the rear wheels and the floating drive shafts are readily removable through the wheel hubs. The bevel pinion is adjustable through a small opening in the rear end of the torsion shaft, which closes by a plate. The brake rods now pass over instead of under the axle and are attached to arms on rocker shafts parallel with the axle and of sufficient length so that the brake rods do have to spread as close to the wheels as heretofore.

The brakes are internal and external,



OILING OF MITCHELL CLUTCH

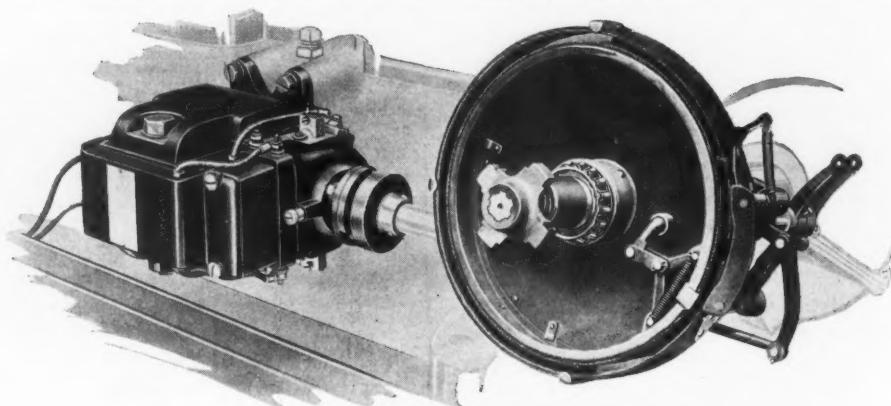
Clutch lubrication is obtained by a forced feed of oil from the motor through a flexible tube and the flow is adjustable

the latter being the foot brake. The steering mechanism is the same as has been used in Mitchell cars for the past 6 years, the only change being that it is now mounted on the subframe. The front axle is not dropped as much as formerly so that the road clearance has been increased to 12 inches, which is 2 inches more than in the 1913 cars.

Unique Spring Construction

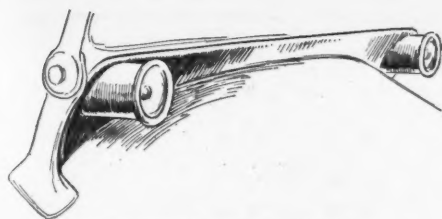
Springs have been lengthened considerably, the half-elliptic front springs being 40 inches long and 2 inches wide, the rear springs the seven-eighth elliptic type with the main members 54 inches long and 2 inches wide. The idea in using this type of spring is that it gives practically the same cushioning effect that is had with the elliptic spring but does this without involving distance rods.

Bodies of the new models are a development of the attractive streamline forms characterizing the 1913 Mitchells. The bodies feature a very deep cowl and deep curves in the upper edge of the doors. Other line refinements are obtained by the rounded back and the smoother curves of the front fenders. Where dash lamps are employed the octopus-eye type is set in the windshield baseboard. The headlights have a special feature in that they are mounted upon a very heavy single pedestal and the wiring is carried through the frame horn and up through the pedestal. All of the electric wiring is carried in conduits and is installed in a way that makes for permanence.



TWO FEATURES OF 1914 MITCHELLS

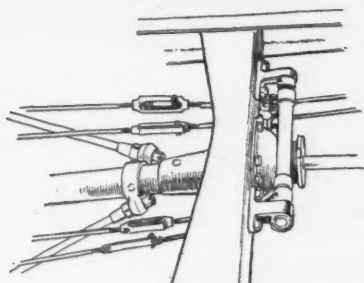
At the left is shown the mounting of the Remy dynamo, which is bolted to the side of the crankcase. At the right is the very simple brake action and the crowfoot of the axle



MITCHELL SIDE LAMPS

These are what is known as the octopus-eye type and protrude from the windshield base-board. It is possible that this arrangement will be superseded by double-bulb headlights

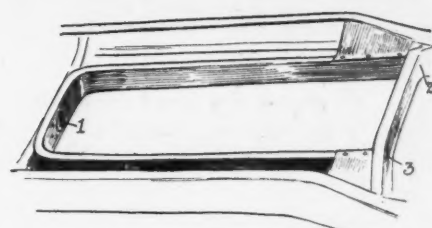
Even the apron has a streamline effect obtained by the long sweep of the lines of the joints by which it is connected to body and fender. The roadsters have a long sloping rear deck with exceptionally ample storage space. The 120-ampere hour Elba battery is carried on the running



BRAKE ADJUSTMENTS

Adjustment of Mitchell brake rods may be made by simply lifting the tonneau floor boards

board. Tire irons are carried at the rear with one extra demountable rim and an option of double irons is offered. The instruments are carried on a cowl board and there is a carburetor adjustment on the steering post and a gasoline primer to the



MITCHELL'S THREE-POINT SUPPORT

The motors are supported on four or six arms which are bolted to a subframe of U shape. The latter is supported at the points marked 1, 2 and 3

intake manifold operated by a small hand pump on the dash. A feature of the equipment is the magnetic exploring lamp carried in a socket under the cowl. The seven-passenger bodies have auxiliary seats which fold into the back of the front seat.

Double Helical Final Drive a Feature of the Paris Show

Construction Adopted by Three European Cars

NOVELTIES of design in bodies or mechanical construction always are expected at the annual Paris motor car shows. In this year's exhibition, just closed, unique ideas were plentiful.

The novelty of the season is the double helical or herringbone gear produced by Citroen and adopted for the entire output of Mors and Gobron cars and for a large number of the Minervas. This gear has been in use for practically 12 months on the Mors cars, but it has only just been offered to the general motor trade. It is being experimented within practically all the leading factories with possibilities of its near adoption by some of them.

At the present time Citroen supplies the gears cut in his own shops, but arrangements are being made for supplying the special machinery necessary for cutting these gears. The double helical gear is not at all new, the Citroen company having been producing them for years, particularly for very big reductions. The new feature is the application of these gears to motor car purposes.

Silence of Helical Gears

It is recognized that silence is secured by the use of helical gears, but the disadvantage of considerable axial thrust makes their use impossible for anything but the auxiliaries of the motor. It was with the object of getting the silence of the ordinary helical gear without any of its thrust that the Citroen double helical gear has been developed.

Up to quite recently the absence of special machinery has made it impossible to produce double helical gears otherwise than by casting or by cutting the two halves of the teeth separately and assembling afterwards. In this latter case the angle had to remain small on account of the cutters used and it was a difficult matter to assemble accurately. The

Citroen machines employ special cutters and allow the production of double helical bevel gears. The inclination of the teeth can be varied at will without any modification in the machine, but it is generally 45 degrees for cylindrical gears and 52½ for bevel. It is possible to obtain these angles without modifying the profile of the teeth.

No Axial Thrust, Is Claimed

It is claimed for the Citroen gears that there is no axial thrust, that frictional losses have been reduced to a minimum and consequently efficiency has reached the highest point. Laboratory tests with gears having a reduction varying between 1-1 and 1-10 show an efficiency never less than 98 per cent and sometimes as high as 98.7 per cent. Perfect silence is secured, and there is an entire absence of shock and vibration. Wear is declared to be almost nil, without any special care being taken in the lubrication, by reason of the small friction and the absence of circumferential play in the teeth. The following figures, supplied by the maker, show the

frictional losses and the percentage efficiency of various types of gears:

Ratios	No. of teeth	Cast dbl. helical 25 deg.	Cast spur gears	Machined dbl. helical 25 deg.	Machined spur gears	Machined dbl. helical 45 deg.
1-1	30 & 30	95.0	95.2	1.033	1	0.567
1-5	15 & 75	94.0	94.2	1.240	1.20	0.719
1-10	11 & 110	93.0	93.2	1.491	1.443	0.863
1-20	4 & 80	...	...	...	...	2.110

EFFICIENCY PERCENTAGE

Ratios	No. of teeth	Cast dbl. helical 25 deg.	Cast spur gears	Machined dbl. helical 25 deg.	Machined spur gears	Machined dbl. helical 45 deg.
1-1	30 & 30	95.0	95.2	97.5	97.6	98.7
1-5	15 & 75	94.0	94.2	97.0	97.1	98.4
1-10	11 & 110	93.0	93.2	96.5	96.6	98.1
1-20	4 & 80	...	...	...	...	94.9

Mors and Minerva are using the Citroen gears in the rear axle only. Gobron is using it in the rear axle of the shaft-driven models, and for the constant meshing pinions and for the drive of the jack-shaft on a chain driven sporting type car. With this they claim to get a car as silent as the ordinary shaft-driven model.

This is an adaption to the herringbone drove as we understand it and as it is be-



DOUBLE HELICAL GEARING FOR FINAL DRIVE

Novel type of rear axle construction which is designed for extreme silence without side thrust

ing used on electrics. As used in America, however, the helical drive usually is between parallel shafts.

Routes and Touring Information From Chicago to Boston in 4 Days



A STRETCH OF TYPICAL STATE ROAD NEAR NEW BEDFORD, PA.

BACK in the russet days of last November, several members of the Chicago Automobile Club conceived the splendid idea of a non-motor stop run from Chicago to Boston. The idea meeting with immediate favor and enough entries being promised to insure keen competition, such a contest was scheduled for June only to be postponed until October and eventually abandoned, for 1913 at least, because the American Automobile Association failed to co-operate with the promoters of the western metropolis in furnishing a stock car class, demanded by the big makers.

Proposed Run Is Feasible

"There is a reason"—courtesy of C. W. Post—for this reminiscent premise. The keynote of this article is that the proposed Chicago-Boston run is perfectly feasible and entitled to the support of both manufacturer and owner-driver; my intentions are to help resurrect interest in a contest that would be productive of the finest sportsmanship. This was demonstrated by my trip to Boston this summer in 4 days. While this run was not a non-motor-stop performance and was made in daylight except for a short time one evening, the fact that the engine of my car—a Packard 30—seemed capable of running indefinitely and further, that the roads

By S. E. Hibben

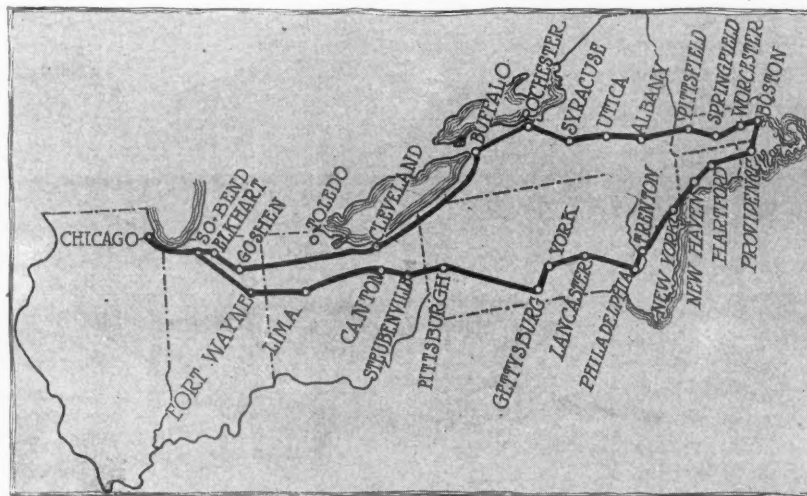
on the average were very good, made it evident that even an amateur would have no difficulty in finishing such a contest.

My Chicago-Boston trip had its inception in the Chicago Automobile Club's proposed non-motor stop run. When this contest was scheduled in June, I entered as an amateur. The postponement until fall, when hard-hearted but lucrative clients begin to interfere with my motoring, forced me to withdraw my entry but I made up my mind to have a personally-conducted tour nevertheless, to satisfy myself that I would not be hopelessly deficient as a competitor against such a veteran as Ray McNamara and to silence the Boston bee that was buzzing so loudly in my bonnet.

We, a party of four gentlemen, left Chicago at 4:15 o'clock on the morning of Saturday, August 2 and arrived at Boston at 6:30 o'clock on the evening of Tuesday, August 5. The total distance covered was 1,130 miles. The actual running time, excluding night stops, and time spent in eating, sight-seeing and making tire repairs, was 47 hours and 3 minutes, making an average for the entire distance of 24 miles an hour. For the benefit of those interested in the economy of operation, I might add that the gasoline consumption was 91.5 gallons, an average of 12.3 miles per gallon, and the oil consumption 2.75 gallons, an average of 410 miles per gallon.

Our first day's run of 381 miles was to Cleveland, where we arrived at 10 o'clock at night, after having been lost at Berea, O., in making a detour. Before we discovered that we had missed the road we ran into a farmer's barnyard. The fact that our average for the last 3 hours of this stage of the journey was cut down to 12 miles an hour shows how almost hopelessly we were lost, all on account of lack of detour information and markings.

After this run to Cleveland, a journey of about 195 miles to the next night control, Buffalo, became a mere jog and so we did not



MAP SHOWING ROUTE FOLLOWED ON EASTERN TRIP

start out from Cleveland until nearly 10 o'clock Sunday morning, August 3, arriving in Buffalo at 6 o'clock that evening.

Our next night control we had fixed, in a tentative way, at Albany and having upwards of 333 miles to make, we got a 5 a. m. start and reached the capital of New York at 8 o'clock in the evening after a most pleasant day's drive through the beautiful Mohawk valley, our route being through Rochester, Canandaigua, Auburn, Syracuse and Utica.

Visit the Wayside Inn

Having another easy jog of about 221 miles for the following day, we did not start until 7 o'clock in the morning. Passing through Pittsfield, Springfield and Worcester and traversing the famed Berkshires, we arrived at Boston at 6:30 o'clock in the evening after making a tour of inspection of the old Wayside inn, made famous by Longfellow.

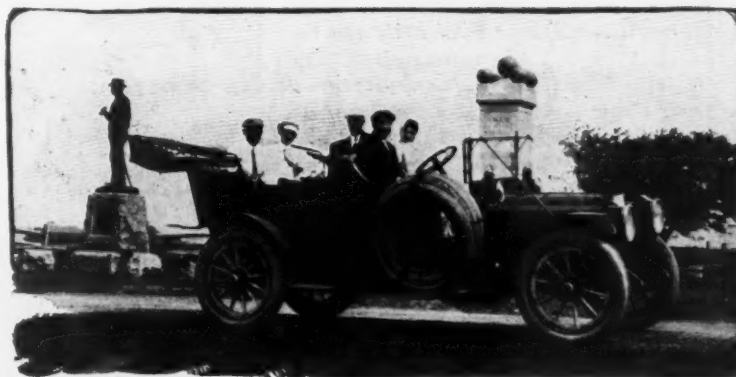
While I say that we went to Boston, in fact we did not go all the way downtown but detoured from the western limits around to Hull just across the bay from the city where we were royally entertained by Fitzroy Kelly who on the next morning showed us more of old Boston in half a day than we ever could have discovered in a week by ourselves and who in the afternoon of that day piloted us through the beautiful winding by-ways leading from the main roads through the historic region south of Boston.

I do not wish to be understood as claiming credit for driving the entire distance myself, for I had in the party a brother George and while I did not let him do it all—with apologies to a well-known cartoonist—he did a substantial part with the result that neither he nor I felt any fatigue.

The trip was not intended as an endurance run and we had no set schedule but merely a tentative one. Nevertheless, we kept this schedule. To show how well we did it, I will say that a week before we left Chicago I made arrangements with my

Boston friend, George Vose, to meet me at the Bay State house, Worcester, Mass., on Tuesday afternoon at 3 o'clock. We arrived there shortly after 2 o'clock and were waiting for him when he drove up.

Speaking of the character of the roads, which is a matter of prime importance next to a good-running engine, the majority of motorists know the good quality of the highways in Indiana and it is needless to say that on the whole we found them excellent and speedy. Notwithstanding the prosperity of the state of Ohio, its roads are not what they ought to be, there being stretches of good road with a too great abundance of poor road. But the promised land was to come. I refer to the roads of New York, particularly the country roads which are practically boulevards, made by the state highway commission, with long stretches enabling the driver to map out his road far ahead and the width enabling him to pass vehicles at speed. Apparently the state commission has jurisdiction in the country but not within the town limits which accounts for the fact that most of the bad stretches are within the towns themselves. As a sample, I refer to the hog-wallow streets of Batavia, New York, which the Blue Book for years has referred to as "wretched." There were, however, one or two bad stretches of road in New York which were under construction, notably between Fonda and Amsterdam, but the magnificence of the finished roads caused us to forget these bad stretches.



SCENE OF FIRST DAY'S FIGHTING ON GETTYSBURG BATTLEFIELD

The new state roads of New York obviously brought the roads of Massachusetts up to the measure of a very high standard. I found the roads of the latter state very good, but not as satisfactory as the newly-built roads of New York and not permitting of any great speed on account of the many sharp turns.

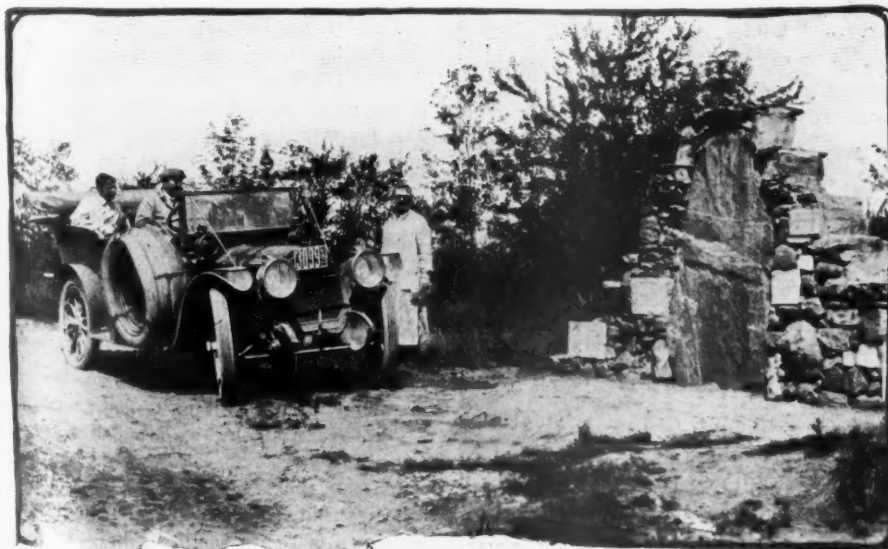
One circumstance stood out very prominently in this trip and that was that New York and Massachusetts are far ahead of the western states with regard to the marking of detours. In Indiana and Ohio, for instance, we meet an obstructed road and are then thrown upon our own resources to find a way around. In New York and Massachusetts, where the roads are under state commissions, printed signs are found at the obstruction giving full information for the detour and markers that make it impossible to get lost.

Followed Lincoln Highway Route

So much for the trip to Boston. Leaving Boston August 7, after a day's layover, we proceeded to New York via Providence, Hartford and New Haven, arriving at the metropolis early that evening. However, it would have been better to have gone from Providence to New London and thence along the shore road as the roads between Providence and Hartford were miserable in many places.

As it happened, the entire trip from New York to the suburbs of Chicago followed the proposed route of the Lincoln highway. When the Chicago-Boston contest comes to pass, and I am sure it will, whether the terminus finally agreed upon be Boston or Chicago, I would recommend that the contestants return by this route for I know that they will be agreeably surprised. After a day's layover at New York, we left at 6 o'clock on the morning of August 9 for our next objective point, Gettysburg, 250 miles away. Our route took us through the charming academic shades of Princeton, through Trenton, Philadelphia, Lancaster and York. Western motorists would be entertained in the eastern part of Pennsylvania by the novelty of some toll gates with keepers passing out a contraption with a long handle that resembles a contribution box in which to place your coin or coupon.

After visiting the Gettysburg battlefield most of the next day, we started late



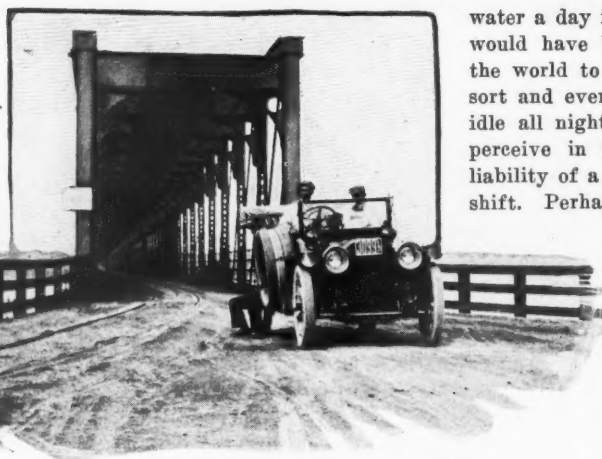
TOP OF JACOB'S LADDER, THE SUMMIT OF THE BERKSHIRES

in the afternoon on a 46-mile drive to McConnellsbury, being enticed by the information that in the very heart of the mountains there, Uncle George, proprietor of the Fulton House, had a chicken dinner awaiting us. Also we were unduly alarmed by the possible hazards of the mountain roads and therefore provided ourselves with the entire next day for the short run of 131 miles to Pittsburgh. We got the chicken dinner all right but the precaution mentioned was unnecessary for we reached Pittsburgh by easy driving at 3 o'clock in the afternoon.

After passing Gettysburg it will be found that the toll houses have been closed by the state highway commission which has recently taken over the toll roads. The roads over the Alleghenies are excellent and indeed remarkable considering the topography of the country. The state commission apparently has not yet put its final touches on these mountain roads but has provided boulevard roads from the western slope of the mountains to Pittsburgh. The grades through the mountains are easy, being negotiable readily on second speed. Unbelievable as it may sound, the steepest grades of the entire trip were encountered near Erie on the road between Cleveland and Buffalo. The scenery through the Alleghenies cannot be surpassed even by the Berkshires and when motorists come to know the good quality of the roads through Pennsylvania, they will prefer this route to that through New York state.

To Canton the Worst Way

From Pittsburgh the best road runs through Cleveland but not caring to duplicate our eastward route, we decided to cut straight across the state of Ohio and go by way of Steubenville, Canton and Lima. We wanted to go to Canton the worst way



1-MILE BRIDGE OVER SUSQUEHANNA RIVER NEAR COLUMBIA, PA., ON WHICH 40 CENTS TOLL IS CHARGED

and we certainly did. I now know why there are so many potteries in that part of the state. It had rained the night before and it took chains on all four wheels and the most strenuous driving to keep the car on the hilly roads. It required 3 hours to negotiate one stretch of 24 miles and the best we could do for the entire day, fighting the roads all day long, was 148 miles to Wooster, Ohio.

Our party voted to make the remainder of the distance to Chicago the next day even if we arrived at midnight. After leaving Wooster the roads improved a trifle but it was not until we reached Lima that we felt assured of keeping the voted schedule. From this point the roads were very good and we reached Chicago at 11 o'clock that night. The distance on this last day was 379 miles which was a much better performance than the first day's trip to Cleveland inasmuch as the roads for the first 100 miles from Wooster were rather poor.

As previously stated, my trip was not a non-motor-stop run but as the engine never missed a stroke and I put only a pint of

water a day in the radiator, I feel that it would have been the simplest matter in the world to have made it a run of this sort and even to have left the motor run idle all night. The only difficulty that I perceive in the proposed contest is the liability of a car getting lost on the night shift. Perhaps some scheme could be devised to overcome any possible difficulty in this regard for no contestant would care to win over another who should happen to become hopelessly lost.

F. E. Edwards, former chairman of the A. A. A. technical committee, tells me that confetti looms up better under the headlights than in the bright

sunlight of day but I should prefer to be guided by additional means, for instance, red fuses such as are thrown off from the end of a train in foggy weather. Then it might be well to distribute pilots familiar with the road among the different machines. In case any car not having a pilot on board should lose its place by tire trouble or otherwise a pilot from a car following could be left with the broken-down machine to guide the driver until he caught up with the pacemakers.

I would therefore recommend the proposed Chicago-Boston contest even to amateurs if they want a novel and enjoyable experience. I am sure that they will get it in such a run. In addition they will meet and commingle with men imbued with the truest sportsmanship.

ANOTHER ROUTE LOGGED

Galveston, Texas, Oct. 25—The official Colorado-to-the-Gulf highway from Denver to Galveston has just been logged. The route which President O. L. Williams of the Colorado-to-the-Gulf Highway Association and other members of the logging party have laid out runs from Galveston to Houston, thence through Harris, Waller, Grimes, Brazos, Robertson, Limestone, Navarro, Ellis and Dallas counties to Dallas, thence to Fort Worth, Fort Worth to Bowie, thence to Childress, Amarillo, and to Clayton, N. M., thence to Denver. Signs of enamelled steel, with blue lettering on a white background, and with a red arrow pointing toward the gulf, are being placed every 5 miles along the road.

TRAFFIC BOTHERS DETROIT

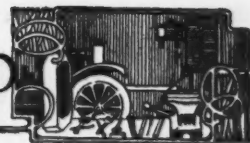
Detroit, Mich., Oct. 25—With its streets choked with motor cars and parking spaces daily growing more inadequate, Detroit is now wrestling with a traffic problem as serious as that which confronted the municipal officials of Chicago. Mayor Marx favors a subway garage, for which Cadillac square offers a suitable location. Architects have estimated that such a subterranean storage house, capable of housing 2,000 cars, could be built for \$2,000,000.



THE WAYSIDE INN NEAR WORCESTER, MASS., MADE FAMOUS BY HENRY W. LONGFELLOW



The Motor Car Repair Shop



WITH many motorists seriously considering laying up their cars for the winter, the method of preparing the car for a good rest is to be desired. The first thing to do is to drain all the water from the radiator and the rest of the system and all the gasoline from the tank and fuel line. The next step is to remove the battery. Since this must be charged occasionally even though not being used, it is best to give it to the local garage and have them take care of it. Jack up the car on all four wheels and remove the tires and their inner tubes. Inflate the tubes enough to make them round. Place a sheet of paper on the floor and place the tubes on top of each other and then place a cloth over all of them. The casings should be placed above one another and covered with cloth. Every part of the car should be given a good cleaning and oiling. The clutch should be disengaged and blocked so that it remains so. All parts which are likely to become rusted should be covered with a little vaseline or graphite. In the case of the wheels, these should also be covered with cloth as shown in Fig. 2. The rest of car should be covered also. If possible the garage should be kept warm and dry and if this is not possible place the tires in room which is warm, dry and dark.

Hints on Resetting Timing Gears

In resetting timing gears, repairmen often neglect some very important factors. For example, take those gears which are to be fastened to flanged camshafts. In resetting such timing gears it should be noted first that the flange is level. The edge of a rule should be run across the flange, and in doing this press the rule tightly against it, and if any space is seen between the rule and flange surface, with the eye on the same plane with the rule edge, the surface is not level.

After the gear is ready to be tightened in place, the screws or bolts, holding it to the flange should be properly tightened. One screw or bolt should be tightened a

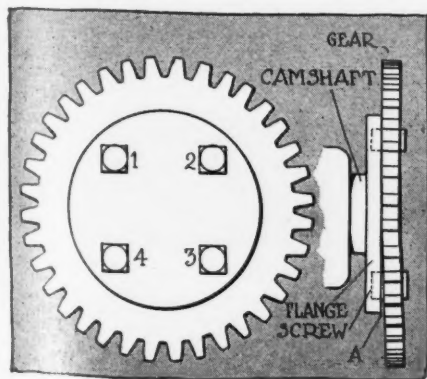


FIG. 1—RESETTING TIMING GEARS
Should the gear bolts be tightened improperly the condition shown at A may result

Methods of Storing the Motor Car for the Winter Months



FIG. 2—GETTING THE CAR IN SHAPE FOR WINTER STORAGE

The wheels should be jacked up and the entire car covered with cloth. The tires should be removed and kept in a warm, dry, dark room

little and then the opposite one tightened just as much. Referring to Fig. 1, screw No. 1 should be turned a little and then No. 3. No. 2 should follow and then No. 4.

Then, beginning with the first screw, tighten a little more and continue tightening a little each time in the same order as mentioned until all are tight. The wrong method would be to tighten No. 1 as much as possible and then No. 2; then No. 3 and No. 4. This may cause the gear to stand away from the flange at some place, as shown in Fig. 1, and also injure the screw threads. This becomes a very important matter in adjusting the lower connecting rod bearings. The above method should be followed in all such cases.

In the case of gears keyed to the shaft, the key should first be fitted to the gear groove and shaft groove separately. In placing the gear in position the key should not cut the keyway. This is prevented by putting the gear on straight, that is, not sideways, so that one part of the gear begins to slide on the shaft before the other.

Play in the Drive Mechanism

An owner complained recently of the drive shaft of his car moving backward and forward violently when the clutch was engaged and released and could not understand the peculiar action, because the clutch was in fine shape and the universals in good condition. A common cause of such action is due to the motor bearings being flattened at the ends.

This tends to push the clutch and

everything attached to its shaft, backward and forward also. Good practice would be to examine or test the motor bearings once each month for end play. This is done by grasping the flywheel firmly with both hands and pulling and pushing as much as possible. Even the slightest play in the flywheel should be taken up as the condition if permitted to continue may call for new bearings. The repairman will peen the end of the bearings or perhaps rebabbit and cut the ends down to size. In some cars this play between the motor and rear axle is due to a poor adjustment of the radius rods and may be corrected by shortening these rods. Not all such rods are adjustable however.

Tempering Springs

Valve springs and clutch springs often lose their temper and when in a soft condition will not do their work properly. Springs are not treated the same way as ordinary steel. E. R. Markham, in his book on steel, recommends the following mixture for tempering springs: Spermaceti oil, 48 parts; neatsfoot oil, 46 parts; beef suet, 5 parts, and resin, 1 part. The spring is first dipped into a solution of potash in water and then heated to a red heat. When in this condition the spring is plunged into the mixture given above. In working with valve springs this operation is only necessary once, but with the heavier clutch springs this should be done two or perhaps three times until the oil in the spring catches fire when the spring is heated.



The Readers' Clearing House



WHY TWO HORSEPOWER FORMULÆ If One is Correct It Alone Should Be Used —No Unit Reader States

CUSHURIACHIC, Mexico—Editor Motor Age—Why this variety in horsepower formula? I see that Motor Age often gives two horsepowers for the same motor, one the S. A. E. and the other the modified S. A. E. Now if the former is correct, why does Motor Age confuse the reader with the latter and if the modified is correct why ever mention the S. A. E. formula? I cannot understand why manufacturers, trade papers and many others in the industry persist in talking about the S. A. E. formula not being accurate and then turning right around and using it. If it is not correct then why use it? If it is correct, then why give the reader any other? Why doesn't every maker of motor cars get the same kind of a horsepower testing machine and then all motors will get the proper rating. With so many different types of dynamometers on the market how can one expect to find every motor rated properly. There does not seem to be any unit which all makers use. Some time ago I understand the S. A. E. tried to get everyone to use the same kind of dynamometer. Why didn't they do it?—I. S. G.

CYLINDER CLEARANCE IN MOTORS Ascertained Usually by Experiment—Two Makes Given

Rochester, N. Y.—Editor Motor Age—What is the clearance allowed between the piston and cylinder on Continental and Northway 3¾ by 4 motors?

2—What standard does Motor Age consider the best for these diameters?—Grandeson.

1—The Continental Motor Mfg. Co. does not build a 3¾ by 4-inch motor. In the 3¾ by 5¼ inch motor which this concern markets in both four and six-cylinder models, the clearance between piston and cylinder wall is .0035 to .004 inch. The clearance in Northway motors is .0005 inch.

2—There is no standard by which one may judge. The clearance between piston and cylinder wall is ascertained usually by experiment and the smallest possible distance used, which will permit the motor to operate without piston slaps or scoring the pistons.

Compression in Different Motors

St. Louis, Mo.—Editor Motor Age—What is the compression in pounds per square inch of the following cars: Packard 48, Pierce-Arrow 66, 1914 Hudson six and the Cole six?—E. H. K.

The cylinder compression in the motor of the Packard 48 is 65 pounds per square inch measured with a compressometer with the motor turning over at 100 r.p.m. The

Pierce-Arrow 66 shows a compression pressure of between 80 and 90 pounds, the Hudson six between 65 and 70 pounds and the Cole six, 60 pounds, when the engine is hot.

ADVANTAGES OF TUNGSTEN VALVES No Need for Regrinding and No Pitting Are Those Claimed

Cleveland, O.—Editor Motor Age—How many miles will tungsten valves with good oil run without grinding? I have been informed that they are far superior to cast-iron seated valves and that they will not pit. Is this correct?

2—A prominent manufacturer gives his purchasers a choice of motors, 4¾ by 6 or 4¾ by 7. What advantage has one over the other?

3—What is the weight of the six-cylinder, five-passenger Mitchell? Also what speed is the car capable of attaining?

4—How many miles will this same model average per gallon of gasoline?—L. B. Lockwood.

1—The addition of tungsten to steel has been found to make the steel tougher and from the data gathered from drivers of racing cars who have used tungsten valves, the results obtained are good. No definite figure can be given as to the life before pitting, of tungsten valves, as the introduction of these is comparatively recent. According to the Rich Tungsten Valve Co. which has been making this kind of valve for about 1 year, grinding never is necessary.

2—Whether a long-stroke motor is better than a short-stroke for life, is a question not yet settled. Engineers differ on this subject.

3—Mitchell, five-passenger, six-cylinder car weighs 3,800 pounds and is capable of traveling 60 to 70 miles per hour.

4—Approximately 12 miles per gallon are obtained.

SPARK GAP SIZE AND MISFIRING If Too Wide Motor May Run Evenly At High Speeds—Racing Car Data

Swift Falls, Minn.—Editor Motor Age—Will a 36 by 4½-inch tube fit a 36 by 4-inch casing so that it will not double up?

2—What causes an engine to misfire when the carburetor is adjusted properly and a new ignition fitted which gives a good spark and the engine has good compression? The engine seems to preignite on one cylinder only but works better when running at high speed. This engine has just been cleaned so it has no carbon in the cylinders. The valves have been re-ground also but it does not fire all cylinders as it should. Splitdorf ignition is used and a Rayfield carburetor is fitted.

3—How many speeds has the Blitzen Benz?

4—What are the dimensions of the Simplex Zip? Is it specially built throughout for speed?

5—Why does carbon cause an engine to vibrate?

6—Is it safe to use kerosene in the cylinders often and should it be put in when the engine is hot and permitted to remain there?—L. D. Daniels.

1—No. The chances are that if you use such a tube a blowout will occur in a short time.

2—If the carburetor is adjusted properly, the ignition system in good shape and the engine free of carbon, one would naturally look to the valves to see that they

are adjusted correctly. Examine the spark plugs when the engine is hot and see that the gap is not more than ⅜ inch. Wide gaps would tend to make the motor work better at high speeds than at low.

3—Four.

4—The Simplex Zip has a bore of 5¼ and a stroke of 5¼ inches. It is a specially built car.

5—Preignition and consequent misfiring due to a carbon deposit, will make the motor impulses so unsteady that the vibration may be felt by the passengers.

6—Kerosene has been found to be a fairly good carbon loosener by many motorists. Some owners make a practice of pouring kerosene into the cylinders every 2 or 3 months and the results are good sometimes. Motor Age advises that kerosene be used only when there is carbon present, for the liquid is not a preventive but a remedy for carbon. A half tumblerful of kerosene should be poured into each cylinder while the engine is hot and the liquid permitted to remain there over night. In the morning the motor should be raced for a second and then permitted to run on closed throttle. Open the throttle wide a few times until the exhaust no longer has a black appearance.

OIL GETS ABOVE THE PISTON RINGS Causes Carbon Deposit and Consequent Knocking

Fremont, O.—Editor Motor Age—I have a 4¾ by 5½-inch motor, but do not know the dimensions of the combustion chamber. What is the probable horsepower?

2—A great deal of oil works up past the pistons, causing a great deal of carbon. Could this be remedied with new piston and rings? The engine knocks when pulling on a grade.—Reader.

1—According to the S. A. E. formula the motor is rated at 28.9 horsepower, if four-cylinder and 43.4, if six. At 1,500 r.p.m. the engine should develop 40 horsepower if a four, and 60, if a six.

2—That the oil makes its way above

Questions Answered and Communications Received

I. S. G. Cushurichic, Mex.
Grandeson Rochester, N. Y.
E. H. K. St. Louis, Mo.
L. B. Lockwood Cleveland, O.
L. D. Daniels Swift Falls, Minn.
Reader Fremont, O.
G. Insel Eagle Grove, Ia.
A. Reader Eldon, Ia.
Congdon & Son Sedgwick, Kan.
M. C. H. New York
E. E. Pomeroy Los Gatos, Cal.
H. Swain Dallas, Tex.
Avoca Auto Co. Avoca, Ia.
A. Neumann Marshfield, Wis.
A. Subscriber Canton, Minn.
C. D. Enfield Jefferson, Ia.
Roy E. Steele Kansas City, Mo.
Dana Seger Erie, Ill.
Constant Reader Sheridan, Wyo.
Reader Duluth, Minn.

No communication not signed by the reader's full name and address will be answered.

the piston and causes a carbon deposit may be due either, to worn pistons, poorly fitted rings, the ring ends in line, worn cylinders, too much oil or improper oil. Any of these conditions would give the oil access to the upper chamber and cause excess carbonization. The best method of determining the cause is to remove the cylinders, measure them and the pistons. The space between the piston and cylinder wall varies with the different makes of motors but .004 would be a good limit. Write to the maker of the motor to get the exact clearance. If the cylinders are in good condition and the pistons are worn much, they should be replaced with new ones. If both pistons and cylinders are in good shape, new rings fitted will help matters. If you write to the motor maker for piston to cylinder clearance, use a heavier grade of oil in the motor while waiting for the answer. This may help a little.

The knocking is due no doubt to pre-ignition caused by the carbon, accumulated by the burning of the excess oil.

IOWAN OVERHAULING HIS MOTOR

Bearings Probably Need Scraping—Rings and Pistons May Be Good

Eagle Grove, Ia.—Editor Motor Age—I have a high-compression 4 by 6-inch overhead valve, four-cylinder motor in my car and to date have driven it 12,000 miles. It was purchased last spring. This winter I wish to clean it up for next year. I want to keep up the power and speed for next year. I want the motor in shipshape regardless of cost.

1—Would Motor Age suggest new valve spring and new piston rings?

2—Should I put in new valves?

I do not care to buy parts and spend money just to be spending it but do want to spend what is necessary to have the car in A1 shape. It is all right now but want to keep it so. It has a D U Bosch magneto on one side and Atwater Kent on the other.

3—Does Bosch make a better high-tension magneto than D U 4 for a 4 by 6-inch four-cylinder motor, and when I am overhauling the car would it pay to drop the Atwater Kent and put on all Bosch?—G. Insel.

1—Only an examination can determine whether the valve springs and piston rings need replacement. Remove all the springs and discard those which are badly distorted. If any are below normal size you might throw them in the "old parts" box.

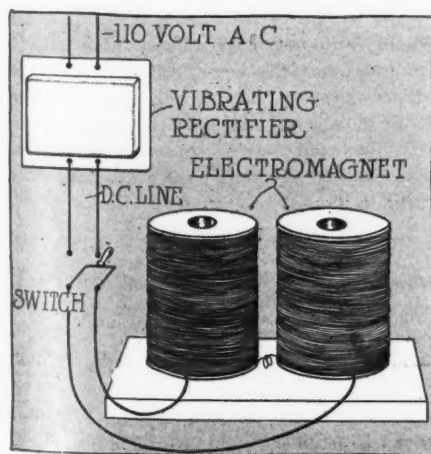


FIG. 1—CONNECTING ELECTROMAGNET TO A CIRCUIT

Where alternating current only is available a rectifier must be used and one of the vibrating type is shown above connected in the line

If the compression of all the cylinders is good and the piston rings do not appear badly scorched there is no reason why they should be replaced. Examine every ring carefully, see that there is no up or down play when the ring is in the guide, and at the same time the ring should be free.

2—Not unless an examination shows the motor needs new valves. Remove all the valves and notice if any are warped. See that the stems are straight. Fit each valve in its guide and note if there is any play. Discard all warped valves, those with bent stems and those which are loose in their guide.

You have not said anything about the motor bearings and Motor Age is of the opinion that a thorough inspection will show that the bearings, if of babbitt or brass, need scraping in, or replacement. A motor with a 12,000-mile record in all probability will be benefited by new bearing faces, although this should not be attempted unless really necessary. Some motors have shown 30,000 miles without the bearings having been touched. However, since you wish to do a good job, scrape in the bearings, both main and rod. Grind in all the valves and above all replace every doubtful gasket. Look over the water connections and stop all leaks. Do not merely stop the leak temporarily, but make a permanent repair. Drain the motor of oil and water completely, timing gear case, reservoir if any, etc. Flush all these compartments with gasoline. Get the motor clean and then inspect the different parts.

3—Motor Age is of the opinion that the ZR Bosch is better for high-compression engines than the DU, but it would be better to take this matter up with the Bosch Magneto Co.'s engineers. If you get good results with the Atwater-Kent there is no reason for discarding it. Only discard parts which do not give service. You would not discharge a workman who was giving satisfactory service nor would you keep one who was not.

REGARDING REAR-AXLE GEARSET

Reasons Given for and Against This Type of Construction

Eldon, Ia.—Editor Motor Age—Kindly state briefly the points in favor and against rear-axle gearsets.

2—Does the Covert Transmission Co. make a transmission that can be used elsewhere than on the rear axle?

3—What company makes the Atlas motor and where is it located?—A reader.

1—Those in favor of the rear-axle gearset claim that it is more quiet running than other types, that better traction is obtained on the rear wheels because of the additional weight over the wheels. Due to this, skidding is said to be lessened. With the rear axle gearset a long drive shaft is possible, which reduces strain on the universals. Only one grease retaining reservoir is necessary with this type and the grease being away from the motor is not thinned by the heat given off. A more accessible clutch is obtainable

when the gearset is placed on the rear axle. The chassis is simplified with rear axle construction.

Those against rear-axle construction and in favor of amidships or unit-with-motor type claim that with the rear-axle construction more weight is brought over the rear wheels than in other types and that this weight increases tire wear. The control linkage in the rear-axle gearset is not simple. The oscillation of the car's springs is communicated to the sliding gears which results in indefinite gear location.

2—At the present time the Covert Motor Vehicle Co., maker of Covert transmissions makes only rear axle gearsets.

3—The Lyons-Atlas Co., Indianapolis, Ind.

CURRENT FOR MAGNET CHARGING

Apparatus May Be Bought or Made at Home—Cheaper to Buy

Sedgwick, Kan.—Editor Motor Age—I am thinking of putting in a charging plant for charging magnets for magnetos and would like very much to have a wiring diagram and to learn what material will be necessary for its installation. We have a 110 alternating current and we can get 220 if it is required, but as the house is wired for 110 would like to connect with that if possible.—Congdon & Son.

In order to recharge magneto magnets direct current only may be used. With an alternating-current line, you would need a rectifier of some sort, the vibrating type being marketed, by the Westinghouse Mfg. Co., Chicago, and the Edison Co., Orange, N. J., being well suited for the work. As shown in Fig. 1 the leads from the alternating-current line are fastened to the rectifier at one end and the direct current produced comes out at the other. A single-throw switch is placed in the circuit as shown and the two wires from the switch attached to the ends of an electromagnet.

HOW TO GRIND MOTOR VALVES

Tools and Material Needed—Operation Described

New York—Editor Motor Age—Will you give me instruction for grinding the valves of my motor and also tell me what materials are necessary?—M. C. H.

Before any grinding is done the following materials are necessary: A screw-driver or a brace for the actual operation of grinding, grinding compound which may be bought at any supply store, some cotton waste and a light spring about 3 inches long. The spring to be used is similar in construction to that used on the auxiliary air valve of the carbureter.

With the tools and material on the bench, the next step is to remove the cylinder plugs above the valves. Then remove the valves themselves. A valve lifter is used for this operation and valve lifters of various types may be bought at a supply store. As soon as a valve is removed look for a mark which shows where the valve belongs. Usually 1, 2, 3, etc., appears somewhere on the valve. This indicates the cylinder into which the valve fits. As each valve is removed it should

be placed on the bench. Intake and exhaust valves should be separated.

To prevent any dirt getting into the cylinder place some cotton waste R, as shown in Fig. 2. Turn the motor over until the valve tappet which operates the valve you are to grind is in the closed position. That is, down as far as it will go. This should be done with each tappet before its valve is ground in. If it is not the valve will not be able to seat.

Take any valve, and with a knife spread a little coarse grinding compound on the face. The face is F in Fig. 2. Slip the spring over the valve stem and then place the valve in its particular guide in the cylinder. Place the bit of the screwdriver or brace into the slot of the valve and place the handle of the screwdriver between the palms of the hands as shown in the illustration. Press down slightly so that the valve face F touches the valve seat S. Rub the hands back and forth so that the valve makes a half turn each time. Each few turns release the pressure on the spring and allow the valve to leave its seat. This should be continued for about a minute and then the valve removed and cleaned thoroughly in gasoline. Should the face and seat appear an even grey color then grinding is complete. Should either contain any black spots the grinding should continue. If there are many black spots use coarse compounds, if few use the fine. When all the valves and seats have an even grey color they should be replaced.

USED KEROSENE TO RUN HIS CAR Californian Relates Experiences With Different Proportions of Coal Oil

Los Gatos, Cal.—Editor Motor Age—As the fuel question seems to be all important these days no doubt some of the readers of Motor Age have tried a few experiments along this line.

Some time ago I desired to find out just how much kerosene I could use with gasoline without making any changes or adjustments in my carbureter. I started in by using one-third kerosene and noting no

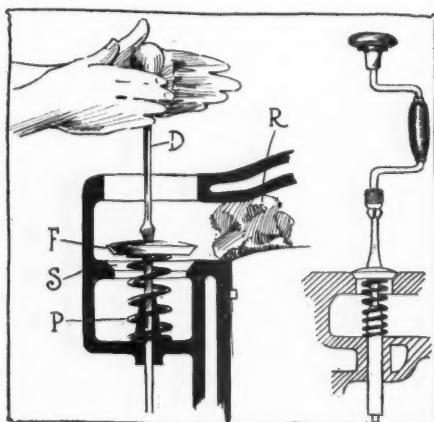


FIG. 2—METHOD OF GRINDING VALVES

Grinding compound is placed on the valve face and with a screwdriver the valve is made to turn on its seat

ill effects. I changed to half and half. After running on this mixture about 10 days, I decided to try all kerosene. For the benefit of those interested, I might add that up to this time I had had no trouble in starting the motor when cold. I have an air starter such as is supplied on the Oakland four-cylinder car, model 42, and a Schebler model O carbureter.

By this time, as subsequent examinations showed, I had the motor well carbonized, which, no doubt, accounts for the fact that I was able to run on kerosene for about 3 days, the motor still running very well. The only thing I noticed was the odor from the exhaust.

I thought I had solved the fuel problem for all time, as well as for all the other motorists, and best of all, I had made no change in my carbureter. I started for town one bright day with a full cargo of passengers, and a swelled head over my cheap fuel—10 cents per gallon. Before starting out, however, I had scraped out a large amount of carbon—and there I made a fatal mistake. I had not proceeded a ½ mile, and that all down grade, when I noticed the motor acting in a very unusual manner. I decided it was not in the best of "spirits" so turned around, and lo! the motor stopped. Needles to say, I did the usual amount of looking things over and, every few minutes, cranking the motor. I believe, however, I did not take the magneto or carbureter to pieces, but even at this point I did not pay much attention to a passenger's remark about my cheap fuel, as I did not suspect the real cause of the trouble—which was simply the fact that, having cleaned out the carbon, there was none there to get red hot and help vaporize the kerosene.

I was forced to telephone for help, and after being towed into the garage it required considerable priming with real gasoline to get started and only then could I make the run home, ¼ mile, by keeping the motor running pretty fast. Later on I returned to a mixture of about one-third kerosene, but now have decided to use nothing but good old gasoline; as the only benefit I found in the lesser price for kerosene, but the work of keeping the motor anywhere near free of carbon was to much of a task for me.—E. E. Pomeroy.

WHY WATER RISES IN FILLER NECK

Some Should be Expected to flow over When Radiator is Full

Sheridan, Wyo.—Editor Motor Age—Why does the water in our Peerless radiator often rise so high, after the engine is stopped, that it runs over the top? It is never boiling when it does this and I am of the opinion that the water, which in our locality contains much alkali, has deposited a scale to such extent that only a small opening is in same and the water, when well heated, causes steam pressure thus forcing the level in the radiator above normal. If I start the motor and let it run for a moment and then stop it, the water will sink down to its usual level.

2—Will 20 per cent wood alcohol prevent water in the radiator from freezing in temperatures ranging as low as 25 below zero?—Constant Reader.

1—In the first part of your question you

state that the water rises high in the radiator when the engine is stopped and in the last sentence you state that the water will sink to the usual level when the engine is stopped. Which do you mean? If a radiator is filled with water and the engine started it should be expected that the water would rise in the filler cap slightly as the pump is forcing the water through the system. If the motor is raced the water may flow over and go out through the overflow pipe. As soon as the engine is stopped the pump stops and the water has no tendency to rise.

With a steam pocket in the water jacket it is probable that the water in the filler neck will rise and run over, but this is hardly true if the pump is operating properly.

2—No. The following formula for making 5 gallons of solution will not freeze when in a radiator, at 25 degrees below zero. Water, 1 gallon, 1 quart; alcohol, 2 gallons, 2 quarts; glycerine, 1 gallon, 1 quart.

MAXIMUM SPEED OF THE BUICK BUG

Car Traveled 123.3 Miles Per Hour—Not Fastest Car Built

Dallas, Tex.—Editor Motor Age—Was the Buick Bug the fastest special American car ever built?

2—What was its maximum speed?
3—What was the speed of the model 10 racing stock car, driven by Strang?
4—Was the Buick driven by Burman in the Savannah grand prix a stock car?—H. Swain.

1—No.

2—One mile in 28½ seconds, or 123.3 miles per hour.

3—This is not obtainable.

4—No.

HOW IS THE COMPRESSION FIGURED

Size of Combustion Space a Factor—Displacement of Motor

Duluth, Minn.—Editor Motor Age—How many pounds compression should a 4½ by 5½ L-head motor have?

2—Given the piston displacement and size of combustion chamber, how does one figure the number of pounds compression?—Reader.

1—The compression pressure may be anywhere from 50 to 90 pounds according to the design of the motor. Some makers would build a motor of that size with a compression pressure of 80 pounds while others may use only 60. A good average today is about 75 pounds per square inch.

2—The compression pressure of an engine may be calculated from the following formula $V_1 P_1 = V_2 P_2$

$$\frac{V_1}{V_2} = \frac{P_2}{P_1}$$

where V_1 is the initial volume or the displacement plus the compression space volume.

V_2 is the resultant volume or the volume of the compression space,

P_1 , the initial or atmospheric pressure, about 15 pounds per square inch,

and P_2 is the resultant or compression pressure.

Let us suppose that the displacement is 400 cubic inches and the volume of the combustion space 25% or 100 cubic inches.

Then substituting in the above formula we have,

$$500 P_2$$

$$=$$

$$100 15$$

$$\text{or } 100 P_2 = 7,500$$

or $P_2 = 75$ pounds per square inch compression pressure.

The above formula is only approximate, modern practice using the exponent 1.3

$$\frac{V_1}{V_2}$$

SIZE OF THE SPEEDOMETER GEARS

Twice as Many Teeth as There are Inches in Tire

Avoca, Ia.—Editor Motor Age—What should be the number of teeth in the gears of a Stewart speedometer on a 1913 Overland 30? Tires are 32 by 3½ inches. How can this be figured out from the size of the wheel?—Avoca Auto Co.

There are sixty-four teeth on the wheel gear and 16 on the speedometer shaft gear. The number of teeth on the wheel gear is always twice as great as the number of inches in the tire diameter. The wheel diameter in this case is 25 inches and is not considered. It is the tire size which is taken. The small gear has 16 teeth and is the same in all cases.

WILL COLD HARM CAR MECHANISM?

Good Paint Will Not Be Affected—Drain the Water

Marshfield, Wis.—Editor Motor Age—Will it harm the finish or mechanism of a car to leave it in a closed garage in a section like ours, where the thermometer may go as low as 40 below zero outside? In this case I would imagine that the temperature would be 10 below zero in the garage. This cold, of course, would be for short periods and not sustained, but the temperature inside the garage might be as low as zero for several days at a time.

2—Will it hurt the battery, which in this case is an LBA? Will the solution in the battery freeze at any temperature?—A. Neumann.

1—If the painting of the car is a good job there is little chance of it being harmed by the cold. Should the air contain moisture there is a possibility of a few unpainted parts becoming rusted. The water should be drained from the motor to prevent any chance of the water-jacket cracking due to the water within freezing.

2—At the temperature you mention the battery will not be affected. The point of freezing of the electrolyte of a battery depends upon the specific gravity of the solution. Sulphuric acid solution of 1.130 specific gravity will freeze at about zero Fahrenheit. The higher the gravity the lower the freezing temperature.

USED TWO MAKES OF CARBURETERS

Buick Company Equipped 31 With Marvel and Schebler

Canton, Minn.—Editor Motor Age—We have a Buick model 31 which has a Marvel carburetor. Do all Buick cars have this make of carburetor?

2—Would Motor Age advise putting on a Schebler model L carburetor for the purpose of making the motor start easier?

3—What is the average life of a Buick 31? Also Metz?—A Subscriber.

1—Some of the 1913 Buicks were shipped with Marvel and others with Schebler carbureters.

2—The Marvel in most cases gives good

results and there seems no reason for changing.

3—The average life of a car depends upon so many things that it almost is impossible to state a figure which would hold. One owner may have a car only a month and destroy the motor by running it without oil and water, yet to get an average this must be figured. Another owner may be very careful and keep the car for 10 years.

COMMENTS ON CYLINDER CHANGE

Many Makers Have Substituted L-Head for the T-Head

Jefferson, Ia.—Editor Motor Age—There is one rather radical change which has been made by a number of makers of high-grade cars in the last year or two, which has been given a remarkably small quota of publicity in the advertising matter of these firms. I refer to the change from T-head to L-head cylinder design. The fact that this change has been made in many cases where the old T-head motors were giving practically perfect satisfaction and had been doing so for years, leads one to wonder if in some cases the desire for efficiency was not somewhat modified or perhaps wholly overshadowed by the necessity of economy in view of the added equipment demanded by the buyer, at about the old price.

As far as power output alone is concerned the authorities seem agreed that the valve-in-the-head motor, preferably with valves set in at an angle of 30 or 45 degrees has the call. On the other hand, it is apt to become noisy, the valve actuating mechanism wears rapidly, and more or less trouble is experienced in maintaining compression. These points make it seem less suitable for touring-car use than either the T-head or L-head types. The T-head permits of larger valves than the L, allows the valves to be better cooled, idles better, insures no contamination of fresh charge about the spark plugs by burned gases, allows larger manifolds, gives easier access to the valves, gives a symmetrical motor, passes the charge straight through from one side of the cylinder to the other, pulls to the last gasp, and costs more to build by one cam shaft and a few other items of added expense. This last is nothing in its favor, but neither should it be anything against it, in the highest-price class of cars.

Whether these new L-heads will give the service of their T-headed predecessors will remain to be seen for a few years. It seems rather significant however that one large firm which has this year adopted the T-head for the first time, has made much of that change in its advertising matter, while we have yet to see the ad loudly proclaiming the fact that "we have discontinued our perfectly satisfactory T-head motor in favor of an L-head construction" which will cost less to build and therefore help pay for the electric

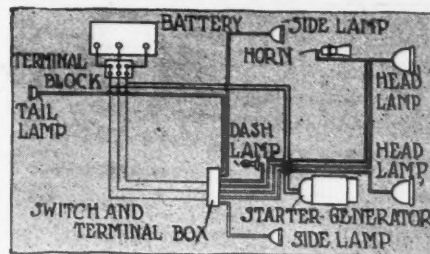


FIG. 3—WAGNER-STUDEBAKER LIGHTING-STARTING SYSTEM

Generator becomes effective in charging when the car is traveling at the rate of 10 miles an hour

starter, 2-foot upholstery, etc.—C. D. Enfield.

WHAT IS COMPRESSION PRESSURE?

Pounds Per Square Inch With Piston at Top Dead Center

Kansas City, Mo.—Editor Motor Age—What is the exact meaning of compression pressure in an engine? A motor is said to have 85 pounds compression. Is that the cranking pressure and if not what would it be in an engine so rated?

2—Give a diagram of the Chadwick carburetor showing how the pressure is obtained on the mixture going into the cylinders.

3—Give a diagram showing the adjustment of model M Thomas steering gear.

4—What mileage does the 6-70 Thomas make on gasoline?—Roy E. Steele.

1—The compression pressure of a motor is the pressure of the charge in the cylinder when the piston is at top dead center. When you crank the motor you feel resistance. This resistance is the resistance of the fuel and air in the cylinder. When this compression is at its height the piston is at top dead center and the compression pressure is the pressure at that point.

2—A diagram is not obtainable from the Chadwick factory. This type no longer is manufactured. The system, however, used a three-stage centrifugal blower between the carburetor and the cylinders. The blower was driven by a belt around the flywheel and operated at six times crankshaft speed.

3—This is not obtainable as the Thomas car no longer is manufactured.

4—Some owners of this car are able to get over 10 miles to the gallon while others claim a mileage per gallon of only 8.

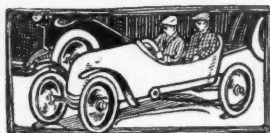
Many owners are using carburetors other than that which was supplied with the car to obtain better mileage.

WAGNER CRANKING SYSTEM SHOWN

Illustrated for Reader—Generator of 12 Volts, Lighting at 6

Erie, Ill.—Editor Motor Age—Kindly publish a diagram showing the wiring of the Wagner lighting and starting system used on Studebaker cars.—Dana Seger.

The Wagner system as used on Studebaker cars is illustrated in Fig. 3. When the car is traveling 10 miles an hour or more the starter-generator sends current to the battery. At 15 miles per hour the charging rate is about 8 amperes but this figure diminishes to about 2 amperes at 50 miles per hour. The battery is of 12 volts as is the generator, but by a three-wire arrangement as shown, the lights are operated at 6 volts.



Cyclecar Development

Zip Makes Cross-Country Run in Iowa

THE Zip cyclecar, made in Davenport, Iowa, made a trip from that city to Iowa City, a distance of 57 miles, last week, traveling over roads frozen into almost impassable ruts after a 3 days' rain, and yet riding in comfort and with reliability. Steep hills with abominable surfaces were climbed without difficulty and in short the side-by-side seating type of cyclecar lived up to its first opportunity in America to publicly show what it could do in the way of really hard going.

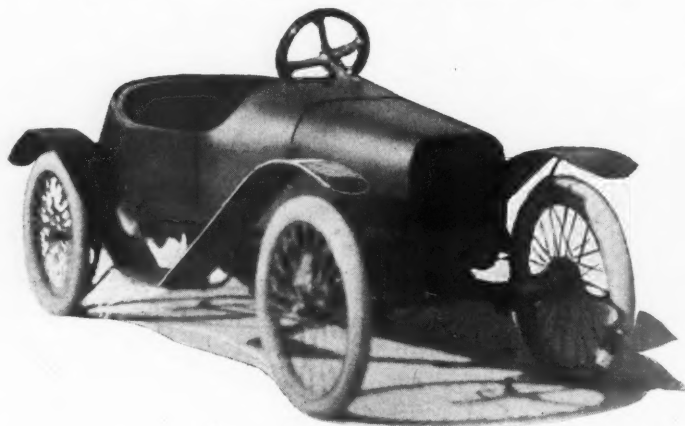
No attempt was made to make time, however, as the car, while waiting for delivery of the standard type of axle to be used later, was fitted with a temporary front axle from an Orient buckboard, which was not up to the work. This axle and the steering gear connected was the only part giving any trouble in the whole trip. The motor—a Mack V-type air-cooled—pulled all the hills with ease. The trip was observed by a Motor Age staff correspondent.

Rough Roads Negotiated

The start was made from Davenport at about 8:45 a. m. The road, soaked after the rain, was rutty, slippery with mud, and full of holes. The car, a belt-friction drive, seemed to run over this surface without any trouble, free from skidding or need of chains, and while the axles and wheels danced about like mad, they carried but little shock to the body. On the whole trip the springs bottomed but once.

After climbing a long steep hill out of town in almost even competition with a big six-cylinder, the Zip settled down for the pull to the next town, Durant, some 20 miles away. The main difficulty was to pick the road, not for comfort, for this seemed to be almost irrespective of road surface so long as the bumps were not too deep, but to save throttle, and as a result the steering gear came in for a lot of overtime, as the car swung to the one side or the other as the better surfaces ran. The speed was around 20 miles per hour, even on these surfaces.

With but a gallon of gasoline in the tanks when it left Davenport, a stop was made at Durant for a fresh supply of another gallon, this filling the tank two-thirds full and being enough for the mileage ahead to the noon stop. A mile out of town the safety of the low-built type of cyclecar was demonstrated when the



THE ZIP CYCLECAR

car was running at 25 miles an hour down-grade and the temporary axle gave out, the spindle breaking short off and the nose dropping to the ground, catching on the spring and sliding for 20 feet. This gave but small shock to the riders. Lifting the car to the side of the road the axle was removed, carried to town, and a few hours later the riders were back with a repaired axle and spindles.

After replacing the axle a start was made for Wilton, 5 miles away. One stop was made between these two towns when the cable on the steering gear, proving to be but iron cable instead of piano wire cable, frayed out and refused to work. A half hour's work, and a piece of wire from a barb wire fence end completed a repair which held, and the motor was cranked up again for Wilton, which was reached without incident.

Novel Steering Repair

At Wilton a dog chain was bought from a country store and put in the place of the steering cable, the links first being flattened out to prevent stretch and the fastenings being taped so that the nuts holding the ends could not come loose. This repair worked well but allowed the steering wheels to yaw considerably. This hindered the speed so that the night saw the car at West Liberty, only 35 miles from the start. This had all been due to the defective front axle and steering cable. The regular front axle with rack-and-pinion steering, which should have been on the car, would have allowed a speed of 20 to 30 miles an hour whereas a speed of about 12 miles per hour was all that was safe with this steering.

The next morning a start was made for Iowa City, now but 17 miles away. A mile out of town, on a downgrade, the temptation to let the car speed was a little too much, and while going at about 18

miles an hour the steering chain broke. The car went off the road, through a deep ditch, up the bank on the other side, and charged a barb wire fence. Nothing broke, and the front springs did not even bottom as they struck the ditch diagonally. The steep angle of the bank also did not upset the car nor make it feel unstable, a surprise to the writer used to a car built higher up.

Another length of chain carried in the car fixed the steering gear after the machine itself had been lifted into the road again. The motor was again cranked.

The night had been cold and now the roads, cut up by the teams of the day before after the rains, were frozen into stone-hard ruts and bumps. The car traveled over the tops of these and kept up its average speed with no difficulty, in spite of surface. Several very steep hills were climbed on the way, and these could have been climbed on high, most of them, had the steering gear been right. Iowa City was finally reached at about 11 a. m.

The feature of the trip was the interest taken in the cyclecar in every town passed through.

The Zip itself is an exceptionally well built cyclecar, resembling a small motor car in outlines, but of the simple reliable type. Once fitted with the regular axle and steering gear, the car can no doubt make the trip just mentioned within a few hours, for it is capable of good speed. No side-by-side seating cyclecar, so far as the writer knows, has made a trip of this kind in America before this, and when the new axle is fitted it will be interesting to see the comparative speed possible in rough touring between the tandem and side-by-side cars.

NEW ONE FROM MENOMINEE

The Dudley Tool Co. of Menominee, Mich., is to place a cyclecar on the market built along more or less standard cyclecar lines, and from the description furnished sounds very promising. The car will have a 10 horsepower V-type motor air-cooled and a planetary-and-V-belt transmission. The wheelbase is 96 inches, and the tread 36 inches. The seats will be staggered, or semi-tandem, allowing a body of the streamline form, not wide so as to look ungainly and with little wind resistance. A test car is now on the road, and the firm expects to turn out from 500 to 1,000 cars

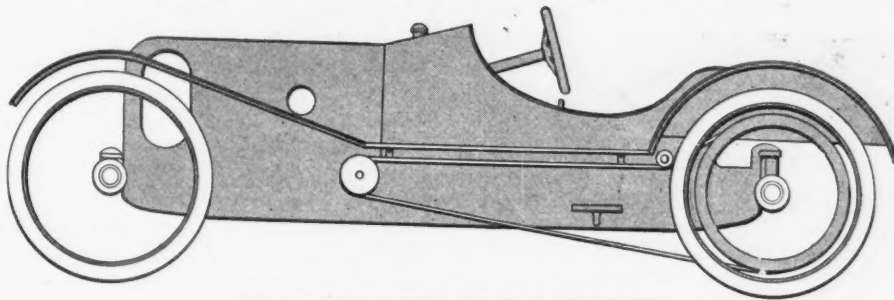
for the next season, starting production about January 1. The price will be about \$375, and the weight around 400 pounds, according to the information given out. The Dudley Tool Co. has ample facilities for producing the cars, including its own drop forge plant.

IMP ON CHICAGO MOTOR ROW

The new Imp cyclecar, one of the first in America, made by the W. H. McIntyre Co., of Auburn, Ind., is the first cyclecar delivered from a factory to a Chicago dealer and is now on Motor row. This adapts European practice to American roads in several novel features which have been described previously in Motor Age.

The drive from the V-type 9-horsepower Mack motor at the front is carried to a friction disk on the engine shaft, and from there taken by a friction wheel on the jackshaft. At either end of

of the jackshaft is a V pulley which connects with the rear belt pulleys by a long leather V belt. This allows plenty of leg room in the tandem seating body; the whole giving a very racy appearance.



SIDE VIEW OF NEW DUDLEY CYCLECAR

Answers to Cyclecar Inquiries from Interested Readers

READER PROPOSES NEW FRICTION Faults of Construction Discussed and Suggestions Made

OAKLAND, CAL.—Editor Motor Age—I have not the faintest idea of what the friction drive is like except what I could see in an Imp cyclecar circular, but I would like to know if the arrangement shown in my drawing, Fig. 1, is all right and I would like to get your views. The two skate wheels A are to be moved back and forth to slide the friction wheel for change speeds and the roller bearing B from a motor car will take the thrust and be forced back and forth to get the pressure between the disks, a spring giving this pressure. What size should the friction disks be if both rear axle and jackshaft pulleys are 6-inch pulleys?

2—Could oil be forced into the crankcase as well by pumping air into the oil tank or by filling the pump full of oil and forcing it?

3—Will the belts jump the pulleys when making a turn if they are 6-inch pulleys and, if so, could this be prevented by spreading the pulley flange?—H. F. Beguhl.

1—The usual practice is to fit a collar around the hub of the friction wheel, in a groove in the hub. Moving this collar by means of a lever slides the hub. The shifting arrangement with the skate rollers would work but would be noisy and unreliable.

Get the contact by thrust on the jackshaft, either at both ends or from a movable bearing at one end, and not by springs, as the pressure must be varied under the different conditions even for the same positions on the wheel. Be sure the wheel is opposite the center of the disk and the jackshaft axle parallel to the disk face. The jackshaft bearings should be adjustable if fastened to the frame. The square joint you show in the shaft would be expensive and soon develop a knock.

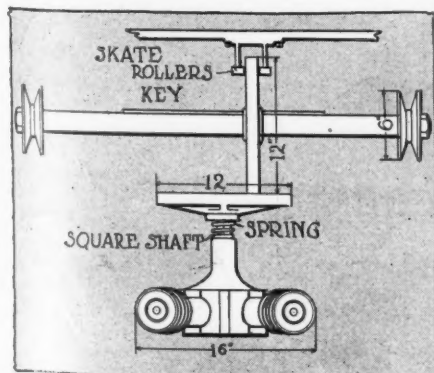


FIG. 1—NOVEL FRICTION DRIVE

The disk and wheel must be the same size—12 to 14 inches. The front wheels, if of 6-inch diameter, will demand a real pulley big enough to give at least 3.7 to 1 gear ratio, or about 18-inch diameter. A 6-inch pulley on the rear would not pull the car.

2—Yes, but it cannot be measured. Use the pump idea if extra oil is necessary and then you will know how much oil goes in.

3—No. They should run normally about 1/4-inch inside the pulleys. This leaves room for the belts to climb for differential action.

LIST OF CYCLECAR PARTS MAKERS Firms Supplying Units Necessary for the Little Vehicles Use

Chicago—Editor Motor Age—Will you kindly list makers from whom cyclecar parts may be had. I am intending to build a cyclecar on the usual simple lines and want to know where to get parts.—H. P. K.

The following firms handle the parts listed; these being for cars following standard parts so far as possible.

WHEELS

Rims; Standard Welding Co., Chicago.
Rear Pulleys; Standard Welding Co., Chicago.
Spokes; The Standard Co., Torrington, Conn.
Hubs; Harris & Reed, Chicago.
Wheel bearings and spindles come with hubs.

FENDERS—

Standard Welding Co., Chicago.

BELTS

Hide Leather & Belting Co., Indianapolis, Ind.
Chicago Belting Co., Chicago.

FRONT PULLEYS—

Merkle Motorcycle Agency, Chicago.

SPRINGS—

Jackson Cushion Spring Co., Jackson, Mich.
—seat springs.
National Spring Co., Newcastle, Ind.
Harvey Spring Co., Racine, Wis.
Tuthill Spring Co., Chicago.

STEERING WHEELS

American Wood Rim Co., Onaway, Mich.

STEEL TUBING

Standard Welding Co., Chicago.

STEERING PARTS

De Cross Cy Car Co., Cincinnati, Ohio.
Flagler Cyclecar Co., 2829 Halsted St., Chicago.

Warren Electric Co., Indianapolis, Ind.

FRAMES—PRESSED STEEL

A. O. Smith Co., Milwaukee, Wis.

FRICTION WHEELS AND DISKS

Rockwood Mfg. Co., Indianapolis, Ind.
Universal Machinery Co., Milwaukee, Wis.

ELECTRIC EQUIPMENT AND LIGHTING
Vesta Accumulator Co., Chicago.
Marburg Bros., 1790 Broadway, N. Y.

CHAINS

Diamond Chain and Mfg Co., Indianapolis, Ind.
Baldwin Chain and Mfg. Co., Worcester, Mass.
Link Belt Co., Indianapolis, Ind.

MOTORS

Universal Machinery Co., Milwaukee, Wis.
Spacke Machine Co., Indianapolis, Ind.
Wizard Motor Co., Indianapolis, Ind.

SIDECAR WHEELS FOR CYCLECARS

Front Wheels Set at An Angle—Wire Wheels Best for This Work

Minneapolis, Minn.—Editor Motor Age—There is a question that is being discussed here as to using wire wheels that are used on motorcycles and giving them a pitch of about 2 or 3 degrees on the front axle knuckles. Will they stand the strain and is their construction so that it is safe to use them in this way?—W. B. R.

Wire wheels universally are used for cyclecars, the American cars using not motorcycle hubs but side-car hubs for the wheels, these otherwise being the same as motorcycle wheels but with a heavy spindle and bearings, made to stand the heavy work. For cyclecars of not over 500 pounds weight these are strong enough.

You probably will not need to incline the front wheels over 1 degree, this depending on the design of the hub and the distance of the knuckle pivot from the wheel hub center. Where possible without too great an angle it is well to have the pivot in line with the tire road contact.

Axles to Fit Sidecar Hubs

Coal City, Ill.—Editor Motor Age—Kindly tell me where I might obtain axles to fit standard sidecar hubs for use on cyclecars.—Nelson Campbell.

You will have to make these to your drawings, presumably of steel tubing and castings. Fig. 2 shows two ways of making these up.

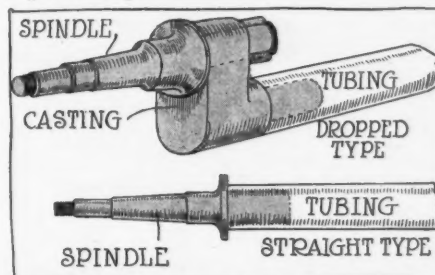


FIG. 2—AXLES FOR SIDECAR HUBS

The Accessory Corner

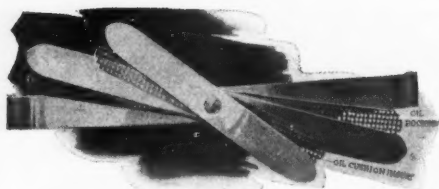


FIG. 1—DANN OIL CUSHION SPRING INSERT

Talking Horn for Cars

THERE is a hand-operated horn which says "Mama" when a crank is turned. It says "O, mama," too, when the same crank is turned in another direction. This horn, illustrated in Fig. 4, is a product of the Talking Horn Co., Middletown, N. Y. By turning the crank shown to certain letters marked on the horn plate the horn is made to talk. An ordinary signal is also obtainable. Three types of horns are offered by the Talking Horn Co., the one mentioned above and selling for \$25; another of the same size and construction, but without the talking mechanism, for \$15, and a smaller horn selling at \$10.

T. S. Flexible Hub

In order to make pleasure cars and trucks ride easier and at the same time permit them to use solid tires for pneumatics, the T. S. Wheel Co., Chicago, has brought out the flexible hub, illustrated in Fig. 3. The feature of this device, which takes the place of the hub supplied with the ordinary wood wheel, is that it incorporates a new movement.

Referring to the illustration, the flange F shown at the extreme left is fastened to the spokes of a wheel, which has had the hub removed. The axle of the car fits into the opening at the center of the device shown. There are two plates P on either side of the hub, and these plates are permitted by a downward movement of the axle to move outward against the tension of the numerous springs S.

The illustration in the center shows how a clamp was made to draw the central portion downward, which is accompanied by spreading of the plates P. These plates have between them odd-shaped bearings shown at the extreme right.

Dann Oil Cushion Spring Insert

Lubrication of the leaves of the motor car spring has always been a problem for the car owner, and were it not for the annoying squeaks which rusty leaves give forth and the attendant stiffness due to the partial rusting together of the leaves, preventing them from working freely, he would not concern himself with trying to get oil between them.

Realizing the need for some sort of a permanent lubrication feature for spring

leaves, the Dann oil cushion spring insert was devised and is now being placed on the market by the Dann Oil Cushion Spring Insert Co., Chicago.

The Dann insert is a perforated strip of metal designed to go under the spring leaf from tip to tip as shown in Fig 1. It is made of a special alloy steel and very ductile, possesses anti-friction properties and to a certain extent is non-crystallizing to prevent cracking under continual bending in service, it is claimed. The perforations in the strips are filled with a special lubricant which is a long-fibrous grease having a tendency to stay in the holes. After the strips are placed between the leaves and the leaves then drawn together with the center bolts and clips, the pockets in the inserts are sealed and hold the lubricant in place.

For the trade, the insert material is manufactured in 1,000-foot lengths and in all standard widths from 1¼ inch up. A completely equipped six-leaf spring is increased in thickness about ⅛ inch by the inserts.

South Bend Spring Wheel

A wheel which may be attached to the hub of any car and which when installed

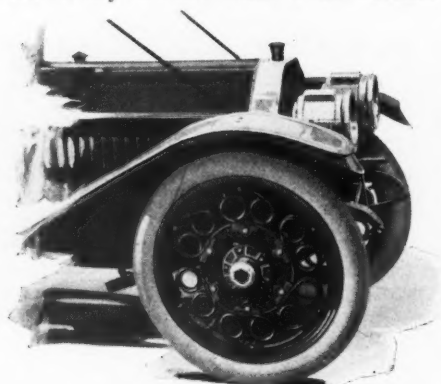


FIG. 2—SOUTH BEND SPRING WHEEL

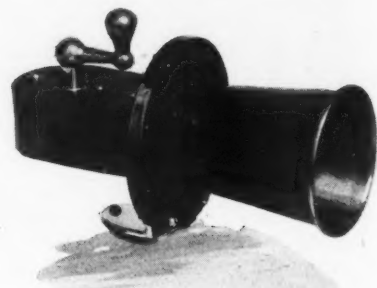


FIG. 4—THIS HORN SAYS "MAMA"

is claimed to give easier riding, less strain on the car parts, a saving in fuel, and a saving in tires, is being marketed by the South Bend Spring Wheel Co., South Bend, Ind. The wheel installed is shown in Fig. 2, and it will be noted is composed of twelve coil springs arranged around the hub of the wheel. In taking bumps or depressions in the road, these springs compress and thus are said to relieve the springs of the car and the rest of the parts of undue strain.

Experiments performed by the maker are said to have shown a fuel saving of 20 per cent and a tire saving of 25 per cent. It is claimed also that the use of the wheels subdues vibration which ordinarily would be transmitted through the steering post. When fitted with solid tires the wheels are said to be easy riding and give the same effect as if wooden wheels and pneumatic tires were used. More speed is possible on rough roads, it is stated, due to the shock-absorbing qualities of the wheel. The coil springs are easily replaced in a few minutes in the event that one breaks while the motorist is on the road.

Whitmore Lubricating Materials

The Whitmore Mfg. Co., Cleveland, O., has brought out lubricants for motorear

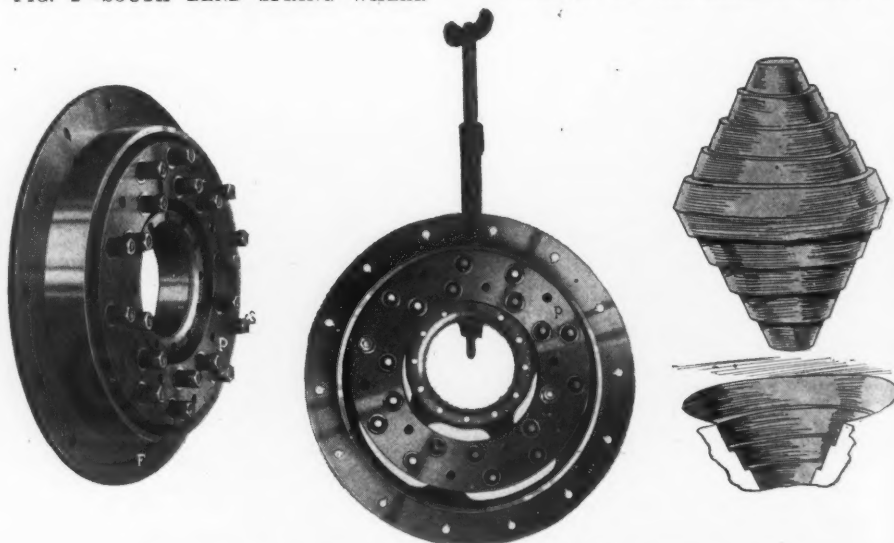


FIG. 3—T. S. FLEXIBLE HUB SAID TO MAKE RIDING EASIER

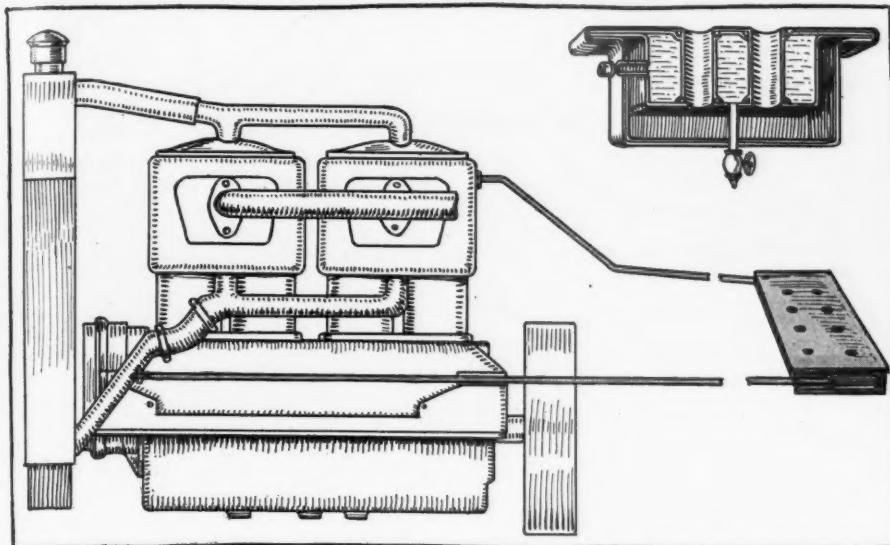


FIG. 5—PEERLESS HOT WATER HEATER LIES FLUSH WITH THE FLOOR

gears, chains and springs which are said to have some exceptionally good features. One product, known as gear protective composition, when placed in the gearcase requires no addition for an entire year, it is

asserted, with the added claims that noiseless gear operation is obtained and gear life lengthened. The substance is said to have a high viscosity and this is one reason why it is to be used advantageously

for gears. The Whitmore company also is marketing a lubricant of this type for silent chains, another for use in grease cups, universals, etc., a third for roller and ball bearings, and a fourth for springs. This concern has made special tests of its lubricant and declares it found that the increase in life has been as much as 100 to 500 per cent. A special lubricant is being marketed for use in worm-gear axles.

Peerless Hot Water Heater

Using the hot water of the cylinder jackets for heating the car is ingeniously accomplished by the Peerless heater, manufactured by the Peerless Radiator Co., Gibbs, Idaho. The heater proper is attached to the floor of the car and lies flush. Two leads from the heater tap the water system as shown in Fig. 5. Two stop-cock controls are offered, one which may be placed on the dash and the other next to the cylinders. The Peerless heater is offered in two sizes No. 1, the six-tube type, and No. 2, the eight-tube type, the former selling at \$35 and the latter at \$40. The detail view shows the location of the water pockets in the heater.

Van Sicklen Speed-Meter Acts on the Pneumatic Principle

UTILIZATION of air as the medium of transmission of motion is the feature of the Van Sicklen Speed-Meter, a new speedometer which will be placed on the market about the first of the year. It is the product of N. H. Van Sicklen, whose new factory is located at Aurora, Ill.

Aside from the unusual power transmitting medium, the new instrument has three features which are noticeable and all of which are attributed to the adoption of the pneumatic principle of operation. These features are the comparatively large size and great legibility of the figures, as the illustrations will show, the great steadiness of the speed-indicating disk and the fact that the air conduit may be bent in any direction allowing complete concealment of the latter.

In general design, the instrument comprises a small rotary air pump, usually driven from the transmission shaft and which maintains air pressure in proportion to the speed of the vehicle, the speed-indication and distance indicating head on the dash operated by the air pressure, and the very small flexible pipe connecting them.

The speed dial is the floating type. The figures indicating speed are large, plain and instead of being set all on one line around the circumference of the dial are staggered, the cipher and all even figures being placed below the center of the exposed portion, while all odd figures are placed slightly above the center, thereby eliminating confusion.

All dials are lithographed on a dead white enameled surface. The speed dial is balanced to one four-hundred-thousand-

ths of a pound. The figures on the odometer are the same size as on the speed dial, 1/4-inch full face.

These dials are prepared in the same manner as the speed dial and indicate mileage to 100,000, operating in steady progression instead of snapping into position at the end of every mile. The figures are so legible that they may be read easily from the rear seat of a seven-passenger car. A feature claimed for the trip portion is it may be reset ten times faster than any other instrument and operated with one hand. In a demonstration the speed dial seemed steady at all speeds, showing no fluctuation, regardless of road conditions.

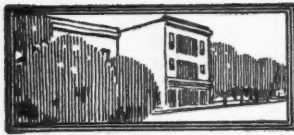
The illustration of the complete instrument shows the mounting ring used where the instrument is assembled on a car and with this one exception it is identical with the instrument used for motorecycle

purposes. The face dial lies directly against the imported bevel glass, is very thin, white enameled so as to reflect no light and the figures showing.

When mounted on a car, whether on a perpendicular dash or cowl board, the shaft is out of sight, no portion, not even the connection at the side being shown, as in mounting it is recessed into position and sets practically flush—the side connection and shaft going straight back through the board into the engine compartment from which point it drops down under the toe-board and floor to a connection attached to either transmission or a crossmember of the frame to a point where the driven member receives the drive from a drive member applied either to the main shaft between the transmission housing and the hub of the universal or directly on the hub of the universal of the car.



INDICATING MECHANISM AND EXTERIOR OF VAN SICKLEN PNEUMATIC SPEED-METER



Among the Makers and Dealers



LOSES His Life in Fire—Charles R. Hoffman general manager of the Lindhe Shim Co., 210 Canal street, New York, lost his life in a fire that destroyed the building in which the company was located October 24.

Miles With Palmer-Singer—F. E. Miles, formerly purchasing agent for the Mals Motor Truck Co. and assistant purchasing agent for the National Motor Vehicle Co., has joined the staff of the Palmer & Singer Mfg. Co., in the capacity of purchasing agent.

Pettit Leaves Studebaker Corp.—W. S. Pettit, for 3 years advertising manager of the Studebaker Corp., has resigned this position to become sales manager of the Commerce Motor Car Co., Detroit, maker of motor trucks. No announcement of a successor to Mr. Pettit has been made.

Mrs. Bennett Sole Beneficiary—By the terms of the will of George W. Bennett, vice-president and general manager of the Willys-Overland company, who died September 17, following an operation for appendicitis, his widow is his sole beneficiary. The will, which was drawn up in Winchester county, New York, November 20, 1908, was probated recently.

Cassidy Forms New Company—Edward A. Cassidy, junior member of the firm of Petry-Cassidy, Inc., of Philadelphia, has withdrawn from that company and organized the firm of Edward A. Cassidy & Co., with offices in the Abbott building, to represent several supply and accessory manufacturers. The line includes the Jones speedometer, G. P. horn and cut-out, New York and New Jersey lubricants and Spitfire spark plugs.

College Graduates for Peerless—As a part of its policy of building for the future, the Peerless Motor Car Co., of Cleveland, has adopted a plan of enrolling in its organization every year a considerable number of picked graduates from the leading American technical schools. These young mechanical engineers are put through a post-graduate course of work in the Cleveland factories. The men this year came from Boston Technical, Cornell, Purdue, Syracuse and the University of Michigan.

Columbus Sales Increased—Under the management of the creditors' committee the Columbus Buggy Co. of Columbus, O., is turning out quite a number of gasoline and electric cars. Total sales for the month of September, 1913, exceeded those of September, 1912, by a large margin. According to the committee when the stock of materials on hand is used up, the production of the six-cylinder car and the runabout will be discontinued. In the gasoline line the company will make only the five and seven-passenger cars and the limousine, on the same chassis.

Board Kentucky Wagon President—R. V. Board, of Boston, Mass., was elected president of the Kentucky Wagon Mfg. Co., of Louisville, Ky., succeeding W. C. Nones, who recently resigned to become chairman of the board of directors at a meeting of the directors held recently. Philip S. Tuley, of Louisville, was elected vice-president of the concern, which manufactures the Urban electric trucks. Mr. Board is now general agent in New England for the International Harvester Co. Officials deny the reports that the Urban maker would be affiliated with the Harvester company. It was reported that a plan to sell the local company to the Harvester people was all

but consummated 2 years ago, when legal entanglements were encountered. So-called trust activities of the government are said to have been partly responsible for the abandonment of the deal.

Judgment for \$30,132 Obtained—A judgment for \$30,132 in foreclosure of trust deed proceedings has been obtained against the Indiana Motor and Mfg. Co., Franklin, Ind., by Albert L. McAlpin, trustee. The judgment was rendered in the circuit court at Columbus, Ind.

Electric Club Elects Officers—The annual meeting of the Electric Motor Car Club, of Boston, was held last week, when the officers for the ensuing year were chosen as follows: Day Baker, president; E. S. Mansfield, vice-president; L. L. Edgar, secretary, and J. S. Codman, treasurer.

Building Small Power Plant—The Farmer Mfg. Co. of Detroit is making a small four-cylinder motor with a 2½-inch bore and 4-inch stroke and thermo-siphon water cooled. It is the intention of the company to bring this out as a single motor, cone clutch, and also as a unit power plant, two-speed forward and reverse gearset.

Comet Cyclecar Co. Organized—Organization of the Comet Cyclecar Co., of Indianapolis, practically has been completed and articles of incorporation will be filed with the Indiana secretary of state in a few days. Provisions are being made to place sufficient capital behind the concern to permit operations on a large scale. Those interested in the company are St. Clair Parry, E. R. Parry and Marshall T. Levey. The Parrys, a few years ago, were interested in the Parry Automobile Co. and are now identified with the Parry Mfg. Co. A cyclecar to sell below \$400 is to be manufactured by

the new concern. Prior to beginning operations on a large scale, twenty-five cyclecars are to be manufactured and given a thorough test before they are placed on the market.

New Plant for McGraw Tire Co.—A committee of the East Palestine O., board of trade has completed the sale of \$50,000 in preferred stock of the McGraw Tire and Rubber Co., of that city, which assures the erection of additional factory buildings for that company in East Palestine. Ground was broken October 13 for the new works, which will be ready by February 1 and will double the capacity of the plant.

Midland Trustee Files Suits—Two suits were filed in the federal court this week by E. D. McCullough, trustee of the Midland Motor Co., the first against the Republic Rubber Co., the Standard Roller Bearing Co. and the Herman Boker Co. These three firms held claims against the Midland company for amounts aggregating \$6,514, for which they were given five motor cars, valued at \$10,000, as security. The trustee is suing to recover the difference between the sale price and the claims. The other suit is of the same character, being against Robert J. and Samuel H. Montgomery, whose claim is \$5,000.

Form Company to Boom Horseless City—Carl G. Fisher, James A. Allison and L. H. Trotter have organized the Speedway Realty Co. to promote Speedway, the horseless city opposite the Indianapolis motor speedway, northwest of Indianapolis. The company has been incorporated with an authorized capitalization of \$10,000 and has its offices in the State Life building. Although less than 2 years old, Speedway has had a remarkable growth.

Recent Incorporations

Boston, Mass.—Palmer & Singer Motor Co., capital stock, \$25,000; incorporators, E. A. McGrath, J. M. Hurley, C. A. Hurley.

Brooklyn, N. Y.—Coney Island Garage, capital stock, \$500; incorporators, W. J. Kelsey, A. Fulder, F. Meyer.

Brooklyn, N. Y.—Utility Garage Co., capital stock \$6,000; incorporators, W. H. Rice, S. E. Miller, H. M. Rice.

Brockton, Mass.—White Automobile Co., capital stock, \$30,000; incorporators, R. Litchfield, S. H. Freedman, P. H. Simons.

Cambridge, Mass.—Myer Abrams Co., capital stock \$50,000; motor car business; incorporators, D. Abrams, P. D. Dresser, J. S. Slater.

Chicago—National Auto Maintenance Co., capital stock, \$5,000; to deal in motor cars; incorporators, J. F. Kelley, R. G. Melcher, C. N. Addis.

Cincinnati, O.—General Auto Parts Co., capital stock, \$30,000; to manufacture and deal in parts; incorporators, G. Osler, P. V. Connolly, S. Stern, I. L. Cressler, W. K. Sibbald.

Cincinnati, O.—Central Auto Repairs Co., capital stock, \$30,000; incorporators, G. F. Osler, P. V. Connolly, I. L. Cressler and others.

Clintwood, Va.—Clintwood Motor Co., capital stock, \$5,000; incorporators, C. E. Starkweather, H. C. Kelsey.

Cleveland, O.—Mutual Motor Stores Co., capital stock, \$50,000; to deal in motor supplies; incorporators, E. M. Goldring, M. West, C. F. Taplin, A. C. Waid, L. H. Stade.

Cleveland, O.—Sterling Spring Co., capital stock, \$150,000; to manufacture and deal in motor car springs; incorporators, F. C. Wood, E. D. Lindersmith, D. P. Osborne, H. F. Ehler, J. A. Flajole.

Cushing, Okla.—Cushing Gasoline Co., capital stock, \$1,000; incorporators, R. B. Jones, C. F. Hillman, F. Brown.

Indianapolis, Ind.—Briskin-Wolsiffer Co., capital stock, \$10,000; to manufacture parts and

accessories; incorporators, J. H. Briskin, H. W. Bullock, C. C. Wolsiffer.

Louisville, Ky.—Boston Starter Co., capital stock, \$5,000; incorporators, H. W. Batson, G. A. Christman, G. Gary.

Marshfield, Wis.—Augustyn Rotary Valve Engine Co., capital stock, \$10,000; to manufacture rotary engine; incorporators, R. J. Strauss, G. E. Harrington, H. E. Hoerl.

Milwaukee, Wis.—Lock Nut Co., capital stock, \$25,000; incorporators, R. Denniston, G. H. Owen, L. S. Pease.

Newark, N. J.—Essex Motors Mfg. Co., capital stock, \$100,000; to manufacture motors and supplies; incorporators, W. H. Simpson, M. E. Huddle, J. J. Coyle.

Newark, N. J.—M. A. Mullin Auto & Livery Co., capital stock, \$100,000; general livery business; incorporators, L. H. Vassant, W. F. King, J. H. Taylor.

New York, N. Y.—Auto Trip Co., capital stock, \$50,000.

New York—Flexible-Rim Tire Co., capital stock, \$25,000; to manufacture and deal in tires and motor vehicles; incorporators, C. E. Clark, E. G. Ofeldt, A. H. Favsur.

New York—American Motorists' Protective Corp., capital stock, \$250,000; incorporators, H. O. Reed, H. L. Sharp, J. Reilly.

New York—Schldwachter Automobile Co., capital stock, \$30,000; incorporators, A. Sanderson, K. R. Norton, M. Schurman.

New York—Detroit Tire & Rubber Co., capital stock, \$2,000; incorporators, R. Henschel, W. A. Wellman, R. F. Potter.

New York—Marathon Tire Sales Co., capital stock, \$1,000; general tire business; incorporators, O. Moynihan, J. Brewster, R. M. Farries.

Oklahoma City, Okla.—Golden Gasoline Co., capital stock, \$50,000; incorporators, H. E. Kelly, E. A. Butt, W. B. Tate, N. S. Riley, C. R. Bennett.

Okmulgee, Okla.—Transcontinental Garage Co., capital stock, \$5,000; incorporators, L. G. Bradfield, X. R. Gill, A. J. Gill.

Perkiomen, Pa.—Oakbrook Motor Mfg. Co., capital stock, \$250,000; incorporators, J. E. Costello, A. E. Williamson, F. B. Nichols.

Portland, Ore.—Doughty Tire Co., capital stock, \$2,000,000; incorporators, T. L. Croteau, A. A. Richards, J. E. Manter.

Quebec, N. Y.—Diamond-Warren Motor Co., capital stock, \$8,000; incorporators, J. R. Dimond, A. C. Warren, T. Dimond.



From the Four Winds



UNIVERSITY Adds Motor Car Course—The University of Minnesota will offer a course in motor car construction beginning early next year. It will be in charge of S. C. Shipley. The course will include a series of illustrated lectures covering motors, transmission, ignition, accessories, etc.

Ask for Convict Road Labor—The announcement that an effort will be made by the Automobile Club of Texas to secure the passage of legislation allowing the use of state convicts to work public roads is attracting attention among motor car owners and others all over the state. The motor club launched the campaign at the good roads meeting in Dallas October 29.

Licenses at Bargain Sale Prices—The Ohio state motor department has unearthed a small graft at Coshocton, O., which has resulted in the arrest of a garage owner on the charge of obtaining money under false pretenses. The garage man is charged with selling sets of number plates, received from the state department as a sales agent, which cost him but \$2 per set to private owners for \$4, which is \$1 less than the owners would have to pay for registration. The graft was discovered by the detective of the state department.

Reaches "Farthest North" in Packard—Melvin A. Hall, who last year completed a 50,000-mile trip around the world in a Packard 30, claims a new record. On a postal card, mailed from Karesuando, Lapland, the modern adventurer tells of his latest achievement as follows: "Farthest north ever reached by motor car, 68 degrees and 27 minutes north latitude and 197 miles north of the arctic circle. North of the northernmost railroad or through road in the world. Five thousand miles from Paris. Impossible to get further."

Mounted Police for Milwaukee—The city of Milwaukee is about to boast of its first squad of mounted police for traffic regulation and supervision in the downtown district. Although for several years the city maintained a small squad of motorcycle policemen to watch for speeding and reckless driving in the outskirts, it was only 2 years ago that traffic officers were stationed on the principal street intersections. These patrolmen are on foot, but the city and its traffic is growing so rapidly that the common council and police chief feel that big city methods should be introduced, with the result that 25 policemen mounted on horses are to be provided.

Co-eds in Motor Car School—Men who think that women cannot manipulate a monkey wrench, screw driver, hammer or a pair of pliers are invited to scan the record of a woman's class which recently completed a course in the Automobile School of the West Side Young Men's Christian Association, Eighth Avenue and Fifty-seventh street, New York. A regular course for women has been put on in the school as a result of the good work of the experimental class for women. The women will meet on Monday and Thursday mornings when there are no men's classes. The regular staff of twenty instructors will teach them. Even to grinding valves and "cranking up," the women will receive the same instruction as men. "Hunting trouble" is a feature of the instruction in which the women students will share. Instructors purposely "queer" an engine by disarranging some part and then the students are set to work to find and remedy the trouble

and get the motor to running. The first class of women students proved themselves adept in this phase of the work. Road lessons in operating cars also will be the same as furnished the men and each woman student will be taken out for individual lessons.

Sandusky Motor Club Formed—The Sandusky County Automobile Club was organized recently at a meeting held at Sandusky, O. The membership at the start consists of about fifty, but gives promise of several hundred in a few years. Much enthusiasm is shown over the club and the good roads movement.

Rescue Car for Miners—Delivery of one of the specially equipped White mine rescue cars to the federal mine inspector at Birmingham, Ala., recently has excited great interest in that mining center. The car is one of the first lot to be distributed by the government. It is equipped fully to rescue, revive and treat entombed or injured miners. The rescue station at Birmingham has been equipped for the past 18 months with a motor car, fitted up locally to carry the rescue apparatus. It has been the direct cause of saving several lives and has hastened greatly the relief given injured men on many occasions.

Trail Boulders Are Dedicated—The granite boulders marking the Boone Lick trail through Missouri were dedicated in many places in and around St. Louis last week by the Daughters of the Revolution who were appointed to the task by Governor Major. The first rock was dedicated at the St. Louis courthouse Monday morning. Tuesday the following markers were dedicated in Missouri: Sanders Tavern, Camp Branch, Cross Keys Tavern, Lewiston, Van Bibber Tavern, Devault, Danville and Loutre Lick Springs. All of these stones are in Montgomery and Warren counties. Wednesday and Thursday the ceremonies took the "Daughters" to Boone, Calloway and Howard counties.

Gasoline Cowboy Now a Reality—From the cattle country and wild fenceless prairies of the southwest comes the story of the sensational capture of a wild Spanish mustang stallion by Tom Clark, of Frisco, Tex., with a motor car as a mount. Jack rabbits, coyotes and antelopes have frequently been run down by motor cars but no record of a horse has been made before. The cattlemen had reported that there was a bunch of wild horses left on the plains. The bunch was led by a stallion which has defied all efforts to effect his capture for several years. Clark, accompanied by J. H. Taylor, Jr., and Joe Taylor, of McKinney, Tex., A. E. Harp and Clint Shepard, of Plainview, were interested spectators at the annual branding on Yelow House ranch last week. Clark is a cattleman and an adept with the lariat. The proposal was made by Clint Shepard that he would drive the car if Clark would wield the lasso in an effort to capture the leader of the mustang band. It was speedily accepted. After a search of 2 hours, the band was espied at a distance. The stallion scented danger and raced off, leading the band from the strange invader of its domain. Shepard immediately opened up the four-cylinder car and the race was on. He safely negotiated dog holes and ditches and drove the car at better than 40 miles an hour in many places. The chase over the prairie was exciting. Horse flesh could not hold out, however, against gasoline and machinery,

so, after running better than 10 miles, the mustang weakened. The car was driven alongside. Clark threw the lariat and caught the horse, which was thrown to the ground and hobbled by the party of daring Texans.

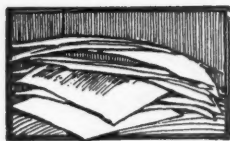
Motor Bus Service for Baltimore—Negotiations are under way for establishing in Baltimore and its suburbs motor bus service and it develops that the Roland Park Co. and local capitalists are behind the scheme. The plan is to use the double deck motor buses, with eighteen seats upstairs and twenty seats downstairs, and introduce the policy of having a seat for each and every passenger.

Military Road Urged by Texans—The construction of a government military highway along the Rio Grande from Del Rio to Brownsville, a distance of more than 500 miles, is being urged by Texas motor car enthusiasts, and petitions, which will be presented to the war department at Washington, are being circulated throughout the territory between Del Rio and Brownsville. Besides affording a splendid motor car highway it would give an isolated region adequate means of communication, aid in the protection of the border and help the government in collecting revenues and keeping down smuggling.

Texas to Follow Missouri's Example—The proclamation of Governor O. B. Colquitt, designating November 5 and 6 as "good roads days," has been enthusiastically taken up all over the state of Texas. Highway associations and county commissioners' courts have issued similar proclamations for their districts. Many counties have requested citizens who cannot turn out for the actual work to contribute the value of their labor to the road funds of the county. Big barbecues will be served by the women to the volunteer road workers in practically every section.

Rides in Wisconsin-Made Car—Wisconsin has granted the chief executive of the state the use of a motor car, and exercising the right of selection accompanying the appropriation, Governor Francis E. McGovern has picked the Kisselkar, a Wisconsin product. Being a resident of Milwaukee, Governor McGovern not only patronized home industry but local industry, placing his order for a Kisselkar 6-48, manufactured at the Milwaukee plant of the Kissel Motor Car Co., of Hartford, Wis., through the Madison agent of the Kisselkar. This is the first time the governor of Wisconsin has had a motor car as a perquisite of his office. In the past the governor has been obliged to hire taxicabs or touring cars from local garages to entertain visiting celebrities.

City License Tag Not Necessary—A city license tag isn't necessary on a motor car in Kansas City, Mo. That ruling recently was made by Judge Latshaw in the criminal court in the case of E. P. Moriarty, president of the Kansas City Motor Car Dealers' Association, appealed from police court. Mr. Moriarty had been fined in the lower court for failing to exhibit on his car a city license tag for which he should have paid the city license inspector fifty cents. Judge Latshaw ruled that the tag was not required in accordance with section four of the state motor statute which states that no tag other than that issued by the state shall be permitted on any car. The city has derived a revenue of \$3,500 a year from the sale of these tags. City licenses still must be taken out, however.



Brief Business Announcements



Recent Agencies Appointed by Motor Car Manufacturers

PASSENGER CARS

Town	Agent	Make	Town	Agent	Make
Abbeville, La.	Sampson Chauvin	Oakland	Mayestown, Ill.	G. C. H. Bellmeir	Jackson
Albany, Ga.	Owens Auto Co.	Cole	Medford, Ore.	C. E. Gates	Cole
Augusta, Ga.	L. C. Edelblut	Marion	Meridian, Miss.	W. H. Florentine	Oakland
Aurora, Ill.	Geo. A. Arnold	Kisselkar	Minneapolis, Minn.	Northwestern Automobile Co.	Auburn
Bellville, Ill.	Monk Implement Co.	Jackson	Minneapolis, Minn.	LaCrosse Auto Co.	Marathon
Beloxt, Miss.	Hart Chinn	Oakland	Minneapolis, Minn.	Bowman & Libby	Marion
Bradford, Pa.	H. E. Camp	Pullman	Montreal, Can.	Major Automobile Co.	Chandler
Brockhaven, Miss.	Hiram Casseday	Oakland	Montreal, Can.	E. N. Hebert	Pullman
Broussard, La.	Broussard Hdwe. & Imp. Co.	Oakland	New Orleans, La.	Denny-Bird Motor Co.	Oakland
Buffalo, N. Y.	Meyer Motor Car Co.	Pullman	New York	American-Marion Sales Co.	Marion
Cairo, Ill.	Cairo Automobile Co.	Regal	Oak Ridge, La.	Dr. C. L. Hope	Oakland
Carrollton, Ill.	C. K. Rafferty	Oakland	Ocala, Fla.	B. F. Condon	Marion
Chicago	J. L. Russell	Pullman	Ogden, Utah	Browning Bros. Co.	Cole
Cleveland, O.	M. D. Coate	Pullman	Oneonta, N. Y.	L. G. Osborne & Co.	Pullman
Columbus City, Ia.	H. L. Duncan	Moon	Orebro, Sweden	Johan Behrn	Pullman
Columbus, O.	Pausch-Selbach Wagon & Automobile Co.	Marathon	Philadelphia, Pa.	Borland Electric Garage	Borland Electric
Columbus, O.	F. E. Avery & Son	Detroit Electric	Philadelphia, Pa.	Automobile Co. of Philadelphia	Cole
Connellsville, Pa.	Connellsville Garage	Cole	Pine Bluff, Ark.	Dilley Eng. Co.	Kisselkar
Corinth, Miss.	J. E. Haynes	Oakland	Pittsburgh, Pa.	Pullman Auto Co.	Marion
Crestline, O.	Kroegel & Parsel	Hudson	Rio Vista, Cal.	L. H. Church & Co.	Kisselkar
Crowley, La.	Thompson-Reiber Co.	Oakland	Rochester, N. Y.	Genesee Motor Vehicle Co.	Pullman
Drew, Miss.	J. B. Ratliff	Oakland	Salt Lake City, Utah	J. P. Fowler Mfg. Co.	Pullman
Fort Smith, Ark.	J. B. Williams	Oakland	San Diego, Cal.	Davies-Leavitt Co.	Kisselkar
Grenada, Miss.	King & Miers	Oakland	San Francisco, Cal.	American Motors Calif. Co.	Marion
Greenville, Miss.	E. C. Berry	Oakland	Shelby, Miss.	L. B. Wilkinson	Oakland
Hattiesburg, Miss.	Riley Boykin	Oakland	Sioux Falls, S. D.	Van Brunt-Bleg Co.	Marion
Hilliards, O.	Leroy Dobyns	Buick	Strasburg, Pa.	Carroll Motor Car Co.	Marion
Hilliards, O.	Leroy Dobyns	Hudson	St. Charles, Mo.	Ringe & Barklage	Jackson
Hot Springs, Ark.	Crawford & Shelton	Oakland	St. Louis, Mo.	Lindell Auto Sales Co.	Marathon
Jackson, Miss.	Dixie Garage	Oakland	St. Louis, Mo.	Electric Garage & Service Co.	Buffalo
Lake Charles, La.	Calcasten Motor Car Co.	Oakland	St. Louis, Mo.	Missouri Motor Car Co.	Willys
Lexington, Miss.	L. E. Barr	Oakland	St. Louis, Mo.	M. W. Bond Auto Co.	Chase
Logan, O.	Gage Auto Co.	Hudson	Sumner Hill, Ill.	W. H. Barring	Regal
Little Rock, Ark.	Henry Leigh & Co.	Detroit	Toronto, Can.	Todd's Garage	Pullman
Macon, Miss.	W. W. Shannon	Oakland	Tullula, La.	W. M. Scott, Jr.	Oakland
Marion, O.	C. C. Stoltz	Hudson	Tupelo, Miss.	E. C. Hinds	Oakland
Mazon, Ill.	Clarence B. Water	Marion	Utica, N. Y.	Central Auto Sales Co.	Marion
			Vacaville, Cal.	E. H. McMillan	Kisselkar

COMMERCIAL CARS

Baltimore, Md.	A. W. Fulton & Co.	Republic	New Orleans, La.	Jos. Schwartz & Co.	Selden
Baltimore, Md.	Neely & Ensor	Kelly	New York	Mendoza Bros. (for Cuba and Porto Rico.)	Republic
Baltimore, Md.	Motor Car Co.	Willys Utility	Norwich, Conn.	Norwich Auto Station	Koehler
Boston, Mass.	Robert Everett	Koehler	Omaha, Neb.	Johnson-Danforth Co.	Republic
Chicago, Ill.	Republic Motor Truck Agency	Republic	Pittsburgh, Pa.	Martin-Coulter Co.	Republic
Columbus, O.	Coats Motor Co.	Republic	Pittsfield, Mass.	Van Sleet-Schwartz Co.	Reo
Columbus, O.	F. E. Avery & Son	Stewart	Sharon, Conn.	Sharon Inn Garage	Koehler
Columbus, O.	R. E. Fisher and C. F. Wilson	Dart	Springfield, Mass.	C. W. North	Koehler
Columbus, O.	M. Morton	Chase	Syracuse, N. Y.	A. J. Jackson	Republic
Columbus, O.	F. E. Avery & Son	Detroit Electric	Waltham, Mass.	Moody St. Garage Co.	Jeffery
Detroit, Mich.	Republic Motor Truck Sales Co.	Republic	Woburn, Mass.	Geraghty Motor Co.	Selden
Ft. Worth, Tex.	Chandler Motor Car Co.	Republic	Woburn, Mass.	Geraghty Motor Co.	Buick
Minneapolis, Minn.	Chase Motor Truck Sales Co.	Republic	York, Pa.	E. P. Bream	Republic
New Castle, Pa.	E. E. Hileman	Republic			

Boston, Mass.—E. C. Beyer has been appointed manager of the local Case branch.

Salina, Kan.—J. B. Moran has sold his interests in the Moran Auto Co., of Salina, to his partner, Godfrey Lundstrum, and R. W. Green. He has gone to Idaho.

Boston, Mass.—The Palmer-Singer Motor Co., of Boston, Mass., organized by Walter Burke, formerly with the Michigan Motor Car Co., has just opened salesrooms on upper Boylston street.

Salina, Kan.—J. A. Hollinger, of the Allinger-Hollinger Auto Co., of Salina, Kan., has sold out and purchased an interest in the Overland Motor Car Co., of Hutchinson, Kan.

Louisville, Ky.—A. B. Challinor is the new manager of the Kentucky Motor Car Co., agent in Louisville for the Oakland. He succeeds C. W. Hutchinson, who has returned to Cincinnati.

Eureka, Kan.—A new garage is being completed at Eureka, Kan., by Ike Wilson and will be ready for occupancy in a few days.

Ancon, Canal Zone.—A. S. Kich, formerly connected with the motor car trade in Chicago, has purchased the International Garage Co. of Panama, and reports business as excellent in that section. Both the Canal Zone and Panama governments are improving the roads on the Isthmus and in consequence the motor car business is correspondingly increasing. The post office ad-

dress of the International Garage Co. is Box 177, Ancon, Canal Zone.

Philadelphia, Pa.—The Fischer Auto Supply Co. of Philadelphia has been adjudged an involuntary bankrupt.

Kansas City, Mo.—J. C. Barcus, formerly of the Marathon Motor Car Co., now is assistant manager in Kansas City for the Haynes line.

Indianapolis, Ind.—E. J. Kane has sold his interest in the Indianapolis Auto Clearing House, Indianapolis, to J. Q. Friend, North Manchester, who becomes president of the company, which handles used cars exclusively.

Baltimore, Md.—The Eastwick Motor Co. is the name used now by the local Ford agency. The same persons are in control as these who controlled the Ford Auto Co. which was the former name of the company handling Ford cars here.

Cleveland, O.—The A. R. Davis Motor Co., distributor of Studebaker cars, has increased its capital from \$10,000 to \$50,000 and put into effect a co-operative system of profit sharing with its employees. Six employees, who have been active in the business growth of the company have been given stock and made directors. The board is now composed of A. R. Davis, John H. Kirkpatrick, Arthur L. Englander, Pard H. Smith, John J. Kenny, Charles A. Rolfe and M. E. Brown. New officers elected are: A. R. Davis, president; A. L. Englander,

vice-president and sales manager; John H. Kirkpatrick, treasurer, and Pard H. Smith, secretary.

Detroit, Mich.—The T. C. Beach Auto Turntable Co., St. Johns, Mich., maker of motor vehicle turntables for public and private garages, has opened a Detroit office at 870 Woodward avenue.

Kansas City, Mo.—W. T. Scarritt is now manager of the White Motors Co., 1505 McGee street, the former manager, Mr. Goodrich, devoting his time and attention to the Chandler line, which this firm has recently acquired in the Kansas City territory.

Kansas City, Mo.—The Knight Tire and Rubber Co., of Canton, O., has opened a direct factory branch at 1528 Grand avenue, in charge of Earle J. Berry, former representative of the Knight company in this territory. E. J. Hess will be the local manager.

Indianapolis, Ind.—A state and local sales branch has been opened by the Howe Rubber Co., of New Brunswick, N. J., in Capitol avenue, Indianapolis. E. S. Keach is state representative, while B. L. Welsh is manager of the local sales branch.

Boston, Mass.—William Van Sleet, formerly manager of the Tower Motor Car Co. of Adams, Mass., has formed a partnership with Philip E. Schwartz. They have taken the Reo agency for Berkshire county, Mass., and Bennington county, Vt., with headquarters at Pittsfield, Mass.

POWER!

It is harder to get power from gasoline in winter than in summer. In winter, gasoline "tightens up." It will not spray nor mix readily. This places an added burden on the carburetor.

If you expect to get the highest percentage of power out of your fuel, **your** carburetor must be constructed to "force" logy winter gasoline, break it up and make it, if possible, as "lively" as it is in summer.

Special features in construction, for the purpose of getting the best results—the most power—from gasoline in winter, are to be found in

STROMBERG CARBURETORS

"The Accepted Standard"

Stromberg Carburetors are provided with a strangle-valve, by means of which a super-rich priming or starting mixture is drawn into the cylinders.

Stromberg Carburetors are equipped with hot air horn and exhaust manifold equipment, by means of which hot air is inducted into the carburetor for the purpose of heating the fuel and increasing its volatility.

Stromberg Carburetors are constructed with an extended venturi, by means of which proper proportions of gas and air are "churned in" with one another, resulting in an even, exceedingly uniform mixture.

We have an interesting booklet describing the above features in detail, telling **why** the Stromberg is the **powerful** winter carburetor. This booklet is free for the asking.

Stromberg Motor Devices Co.
54 East 25th Street, Chicago, Ill.

Branches: **NEW YORK** **BOSTON** **DETROIT**
INDIANAPOLIS **MINNEAPOLIS**

PACIFIC COAST DISTRIBUTORS: Chanslor & Lyon Co., Los Angeles, Portland, Fresno, Spokane, San Francisco, Seattle. Canadian Distributors: Russell Motor Car Co., Toronto, Montreal, Hamilton, Winnipeg, Calgary, Vancouver.

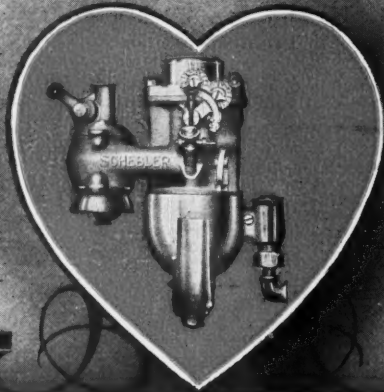


When Writing to Advertisers, Please Mention Motor Age.

Contributor to the Lincoln Highway

SCHEBLER

*The Aristocrat
of Carburetors*



"The Heart of the Automobile"

WHEELER & SCHEBLER

"Pioneers in Perfection" of Carburetion

MANUFACTURERS
INDIANAPOLIS U.S.A.

THE SCHEBLER IS THE ACKNOWLEDGED STANDARD CARBURETOR OF THE WORLD

Branches

NEW YORK
BOSTON
PHILADELPHIA
ATLANTA
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CHICAGO

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DENVER
SAN FRANCISCO
LOS ANGELES
SEATTLE
MONTREAL CAN.
SIDNEY AUSTRALIA

Service Department

Distributors

Every city and town in
the United States and
Canada • Europe and
• Australia •

The Hand Klaxon

\$10



KLAXONET

Lovell-McConnell Mfg Company Newark, N.J., U.S.A.

KLAXON

"The Public Safety Signal"



KLAXON

When Writing to Advertisers, Please Mention Motor Age.



At Critical Times You Can Depend On

Multibestos BRAKE LINING

ON the steep hills and narrow, rock-strewn roads of country districts where danger lurks at every turn, it is of vital importance that your brakes be responsive and that you have the most perfect control over your car.

The rounding of any corner may bring you "head on" with a fellow motorist or heavy country wagon with scarcely room to pass and with the clearance of a bare few inches on the edge of a steep incline.

At times like this your brake lining carries the full load of responsibility and literally decides your fate.

It should be equal to such great responsibility.

It should be reliable and dependable in any emergency.

It should be Multibestos, the Brake Lining of Quality, with the Grip that Grips and with a strength which never fails in tight places.

Send for booklet

"Safe Within the Grip of Multibestos"

Standard Woven Fabric Company

Framingham, Mass.

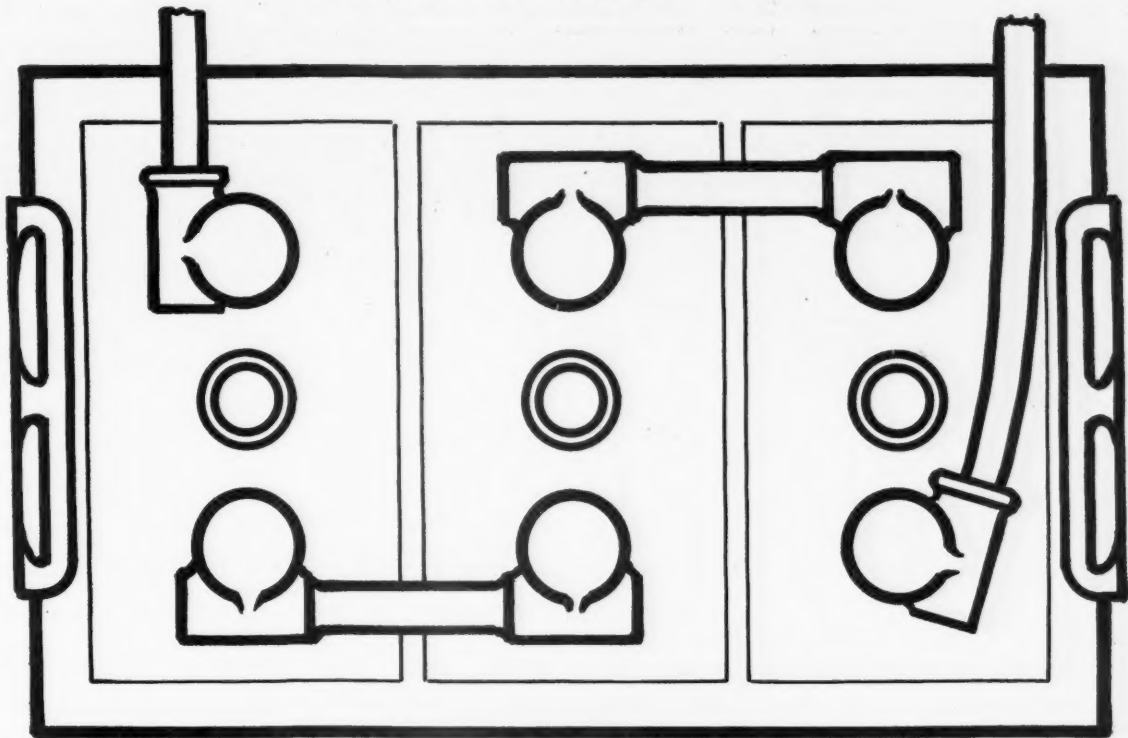
SALES BRANCHES

NEW YORK, 276 Canal St.
BOSTON, 903 Boylston St.

PHILADELPHIA, 1427 Vine St.
CHICAGO, 1430 Michigan Blvd.

SAN FRANCISCO, Fred Ward & Sons, Inc.

THIS IS THE TOP



of an



Storage Battery

Unscrupulous imitators are making Storage Batteries that look like the L B A.

Don't be fooled into buying a car equipped with a low priced imitation of the L B A.

Look on Battery for the



Trade Mark

It is your insurance of the inner works of the battery, which cannot be successfully imitated.

Branches in principal cities and Service Stations all over the United States, just to take care of you.

Write us for full information

Willard Storage Battery Co., Cleveland, Ohio

New York Branch—136 West 52nd Street
San Francisco Branch—243 Monadnock Bldg.

Indianapolis Branch—438 and 439 Indiana Pythian Bldg.

Chicago Branch—2241 Michigan Avenue
Detroit Branch—1191 Woodward Avenue

Depots in All Principal Cities in the United States, Canada and Mexico

(70)

You'll Need It When The Snow Flies



RAISES OR
LOWERS TOP IN
ONE MINUTE

RECORD
OPERATION 30
SECONDS

LIFTER HANDLES
ONE SIDE—
YOU THE OTHER

TOP CAN'T SLIP
BOWS CAN'T
BREAK

SIMPLE!
A GIRL CAN
HANDLE THE
HEAVIEST
TOP

CAR OWNERS

This device makes the work of raising or lowering the Top a question of seconds—not of minutes.

No more two or three “man power” struggling with refractory bows, in the car and out of the car.

No more falling over the passengers in a vain “one man” attempt to make both sides go back in unison.

Your investment of \$2.50 will bring you the highly polished telescopic Simplex Auto Top Lifter, which actually takes one side of the top and raises or lowers it just as fast or as slow as you push the other side up or down.

Here, then, is a big investment in comfort and convenience—a time saver—a preserver of bows and top—a device you can shove together and carry in your tool box.

\$2.50 THREE \$2.50
SIZES

We don't ask you here to write for more information—the top lifter is so simple that there is nothing more to be said about it.

Once it is in your possession you'll say—“I wonder how I ever got along without it,” or maybe, “Well, the fellow who invented that certainly was lazy.”

Send us \$2.50 today, giving the name, model and year of your car. The top lifter comes in three sizes, you know.

Don't delay. Bad weather is here and you'll need this little helper every day.

DEALERS

Here's a chance to equip every touring car in your territory. The price is negligible but your commission is liberal and your sales in bulk will net you a handsome profit. Send for demonstrating lifter NOW.

Simplex Specialties Co.
69 Buhl Block Detroit, Mich.



All cars fully equipped
including

Delco

Electric Lighting, Cranking
and Ignition with automatic
spark control.

*Note the Names
of Parts Makers*

Continental Motor Mfg. Co.
makes the engine.
Delco Electric Lighting,
Cranker and Ignition.
Timken Roller Bearings.
Spicer Joints.
Brown-Lipe Differentials.
Parsons White Bronze in
crank shaft bearings.
Warner Transmission.
Collins Curtains.
Moon Construction.



Moon
Light Weight
Six-50

Torpedo, Four-Passenger
Touring, Five-Passenger
Price, Complete
\$2,150.00

Streamline
Six or Seven-Passenger
Price, Complete
\$2,225.00

Everybody Wants A Six

for its evenness of torque and smooth, easy running. Up to now mighty few have been able to afford a Six because a Six meant a 4,500 or 5,000 pound car—big initial cost and cost of upkeep for such a big, heavy car is almost prohibitive for the man of moderate means.

The \$2,000.00 car buyer simply couldn't look at a big Six, either to buy or to keep—this very fact that it is beyond him and its many advantages have made him absolutely hungry for a Six.

That's the Reason for The Light Weight Six

It gives the buyer a Six—all its advantages. The initial cost is within his means. The upkeep is no greater than that of a Four of the same power. That's why the Light Weight Six is *here* to-day and coming stronger every day. It's the big thing for 1914. There are some other good light weight sixes—but we're talking to you about the Moon—a genuine Light Weight Six. And—just remember this vitally important fact—

It's Not the NAME But The WEIGHT

That Makes A Light Weight Six LIGHT

A car weighing over 3,500 pounds, no matter whether it's called a Light Weight Six or not, is not a Light Weight Six. That's simply because it does not give Light Weight Six economy—it is not down to a weight that can. A Light Weight Six to be a genuine one must be able to do exactly as much as the big, heavy, expensive Sixes at *less* expense in gasoline consumption and other upkeep cost. They can't do this or accomplish this economy unless the pounds of weight per horsepower are identical between the two cars.

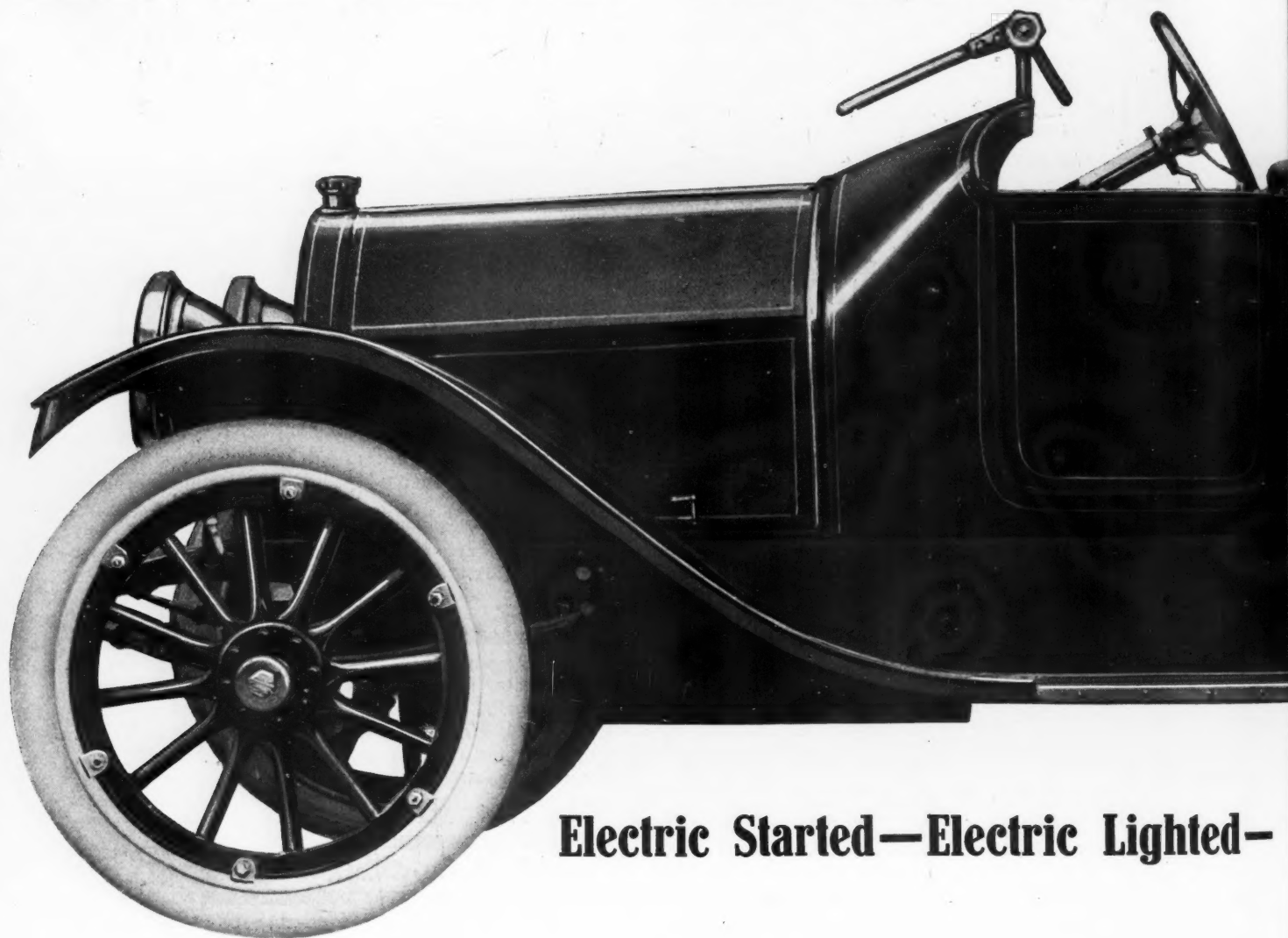
The Motor of the Moon Light Weight Six-50 weighs 590 pounds. It develops 58 horsepower on dynamometer test at 1,800 revolutions a minute. Take out your pencil and figure. So—if you're going to supply what you recognize as a *demand*, supply it with a Light Weight Six that *is* a Light Weight Six—the Moon.

Some Territory Still Open

There are still a few spots on the map not occupied by Moon dealers. It is possible that you are located in one of these places—write and find out. If open we will send a representative who will convince you.

MOON MOTOR CAR COMPANY
ST. LOUIS, U. S. A.

A New Series



Electric Started—Electric Lighted—

FIRST CAR At Less Than \$1000

The Paige still sets the pace. Among all moderate price cars it has set the pace for three years. It has not shared the leadership—it has held it. And now comes the Paige with electric starting and lighting for \$975. It is the New Series Paige 25, the newest development of the famous model that laid the foundation of Paige reputation. The Paige 25 is the first car with electric starting and lighting equipment ever marketed at less than \$1,000.

Compared to Other Cars it is Underpriced at Least \$100

But the low price is typical of Paige leadership. The Paige is always underpriced compared with other cars. This new model is, by long odds, the biggest value in the market. It has all the style of larger cars and high-priced cars. The semi-streamline design of the body gives it distinctive beauty.

It is a full five-passenger car. No cramping of space. The seats are wide, the cushions deep. The wheel base is 110 inches long. That's a desirable size. Not so long as to add a lot of weight, but long enough to take the bumps.

The sturdy Paige motor is as quiet as the watch in your pocket. Before the car had electric starting equipment many's the Paige owner that went around in front to crank his motor when it was running.

You will be proud of this Paige 25. It will give all the service any one could ask for, with a knowledge that the most has been bought for the money.

IT IS THE FINANCIAL INDEPENDENCE OF THE PAIGE COMPANY COUPLED WITH QUANTITY PURCHASES AND FACTORY EFFICIENCY THAT HAS MADE POSSIBLE THIS CAR for \$975. The price has not only been lowered but refinements have been added.

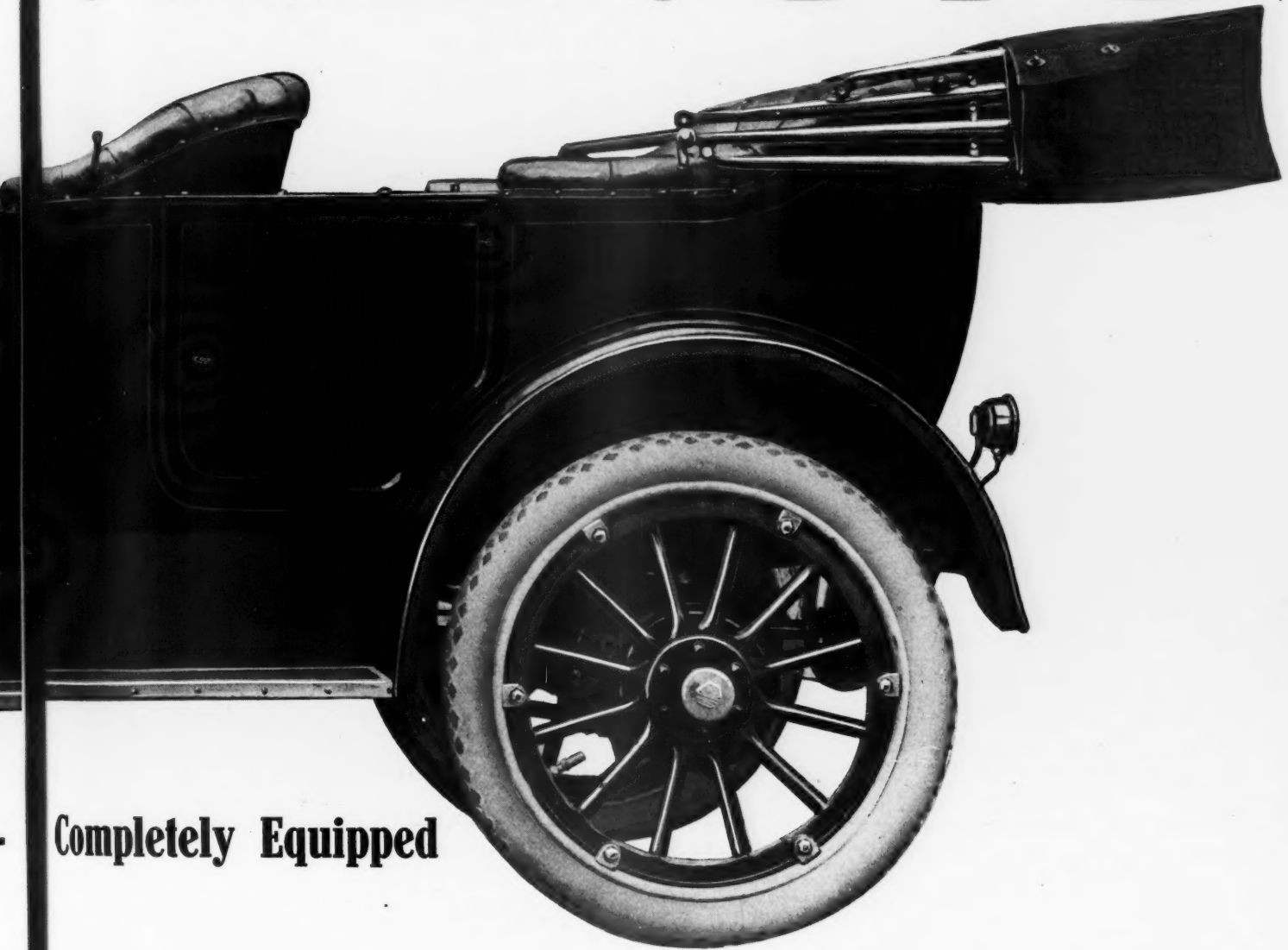
No cars in the world are made more efficiently and more economically than Paige cars. This is a broad statement to make but the facts bear it out absolutely.

The Paige Company is the only large automobile company today that is operating with a very low capitalization, preferring to have profits go into Surplus Account—with absolutely no bonded indebtedness and with no preferred stock.

Paige-Detroit Motor Car Co.,

When Writing to Advertisers, Please Mention Motor Age.

PAIGE \$975



Completely Equipped

With Electric Starting and Lighting

Think what it means to the Paige Company not to be obliged to pay out a dollar for interest charges instead of having to carry, as many other automobile manufacturers are doing, a bonded and preferred stock indebtedness running into millions and being compelled to spread the interest and sinking fund charges as overhead expense on every car they manufacture.

Is it surprising that with this advantage they have been able to build and sell this remarkable car at \$975—the first electric lighted, electric started car ever produced under \$1,000?

Now, then, the question for you to decide when buying your car is "DO YOU WANT ALL OF YOUR PURCHASE MONEY PUT INTO CAR—PUT INTO EQUIPMENT—PUT INTO AN ELECTRIC LIGHTING AND ELECTRIC STARTING SYSTEM, OR DO YOU WANT TO DO WITHOUT THESE CONVENIENCES AND HAVE PART OF YOUR MONEY USED TO BUY COUPONS FROM BONDHOLDERS?"

Next year or the year after some manufacturer may produce an electric lighted, electric started car below \$1,000, but today the only way you can get a car with these essential conveniences at this price is to buy a Paige.

SPECIFICATIONS

Motor—25 H. P., 4 cylinders cast en bloc, enclosed valves all on left side.

Lubrication—Self contained, constant level splash and force system. Plunger pump operated by cam shaft.

Transmission—Unit with motor, chrome nickel steel gears and shafts tempered and treated; annual and Hyatt high-duty roller bearings, three speeds forward and one reverse.

Clutch—Multiple disc, with cork inserts.

Wheel Base—110 inches.

Carburetor—Float feed, automatic, dash adjustment.

Ignition—Bosch magneto, variable spark.

Tires—Goodyear; 32 x 3½, safety treads on rear.

Equipment—Silk Mohair Top; quickly adjustable inside curtains; top boot; ventilating windshield built into body; speedometer; black enamel electric headlights, equipped with dimmers; electric tail light; demountable rims; one extra; foot and robe rails; tire irons; horn, pump, jack, tools and tire repair outfit, complete.

Price—With above equipment complete with electric lighting and starting system, \$975.

304 21st Street, Detroit, Mich.

When Writing to Advertisers, Please Mention Motor Age.

No Other "Six" in the World Near This Price

The new Studebaker "Six" stands absolutely alone and apart in the entire field of six-cylinder cars.

At its price of \$1575—less by hundreds than any other "Six"—it confers the operative advantages of the "Six" emphasized and enhanced because this "SIX" is a Studebaker-manufactured "SIX."

It affords passenger capacity for seven.

It brings the manifest advantages of electric lighting and starting through a two-unit system that has proved itself on thousands of Studebaker cars.

Never before has such a car been offered at \$1575.

Today there is not such another car, at this price, in the entire world.

Six Thousand Manufacturing Operations

How completely the Studebaker "SIX" is the product of the great Studebaker plants you will realize when you know that its construction requires more than 6,000 manufacturing operations.

Throughout the rear axle and transmission, and in the front wheels, we use 13 Timken roller bearings for quiet, easy running.

In fuel consumption we believe the "SIX" will match; if not surpass, the economy of any car of equal horsepower. Its motor size is $3\frac{1}{2} \times 5$ inches.

It is economical because, in spite of its 121-inch wheel-base, it is light, and easy on its 34x4 inch tires; yet it is wonderfully strong.

Carries Seven in Comfort

It is generously roomy and richly upholstered, and carries its seven passengers in utmost comfort.

In design and line, the "SIX" acknowledges no greater beauty and grace.

The starting and lighting system is the Wagner two-unit, starting motor and generator separate.

Lamps are Gray & Davis' highest quality, parabolic type.

In short, the "SIX" lacks nothing in style, beauty or comfort.

Studebaker

Electrically Started
Electrically Lighted
Seven-Passenger

A "Six" That Has a Field All To Itself

This superb new Studebaker "SIX" is a manufactured "Six" down to the smallest essential detail.

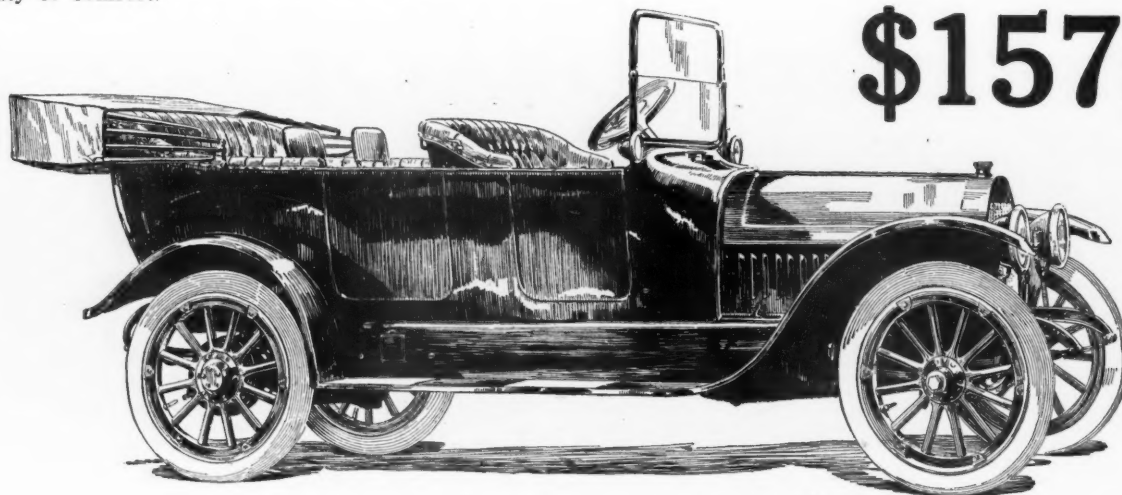
Any other kind of a "six" we decline to consider in comparison.

In a "six" you must have manufactured accuracy—every "six" part must synchronize with every other part.

And—even so—there is no other "six," either assembled or manufactured, which is even near the Studebaker "SIX" in price.

Studebaker, Detroit, Mich.

\$1575



"4"
Studebaker

Electrically Started
Electrically Lighted
Five-Passenger

Try To Find Another "Four" Like This

We hold fast to four positive convictions concerning this new Studebaker "Four."

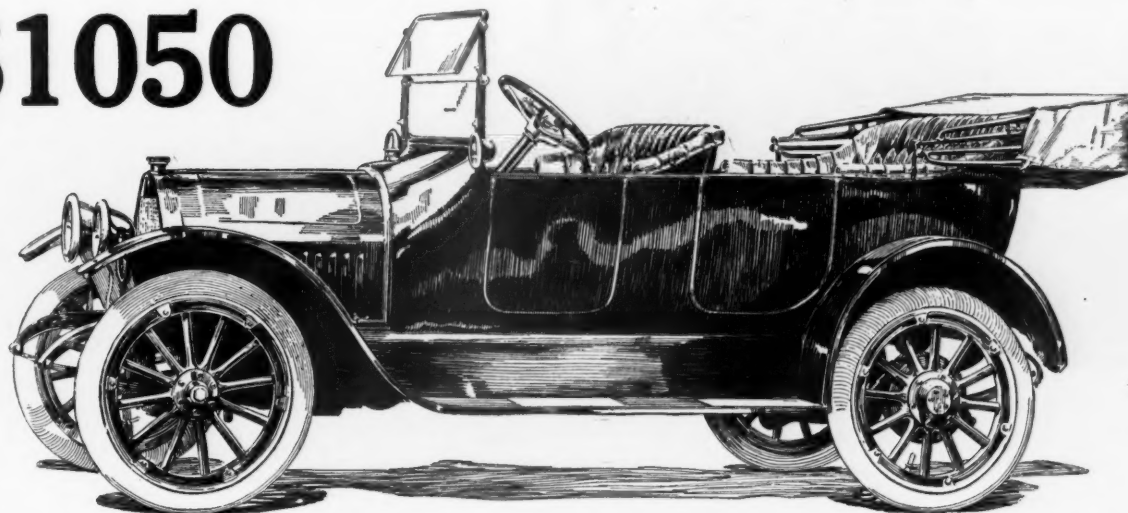
We are convinced, to begin with, that you will not find another "four" which compares with it in value.

We are convinced that it will eventually compel those above it in price to give more; and those below it, to charge less.

We believe it will cause more changes in ownership among those who have waited for a higher quality to be brought down to this price than any "four" which has preceded it.

Studebaker, Detroit, Mich.

\$1050



This "Four" the Final Word Among Four-Cylinder Cars

This Studebaker "FOUR" has been developed from our experience in building 110,000 "FOURS."

Its price, \$1050, represents the outside limit of price for a "Four," because no "Four" can give more, in actual value or performance, than this one does.

So its price is right. Its capacity is right. Its power is right. It is the right type—the last word among four-cylinder cars.

Thirteen Timken Bearings

Nothing that we can say here will give you an adequate idea of the power possibilities of this car—or of the things of which it is actually capable.

The long-stroke motor presents the latest approved engineering practice—cylinders cast en bloc, valves enclosed, exhaust and intake manifolds integral.

Thirteen Timken bearings reduce friction and wear to the minimum at every point in the transmission and rear axle and in front wheel hubs.

Its rear axle is of the full-floating type, and completely accessible.

The rear springs are full-elliptic, very long and easy, and with the lower member suspended beneath the axle.

Electric Lighting and Starting

It has left hand steering and central control.

The electrical starting and lighting equipment is the Wagner two-unit system—

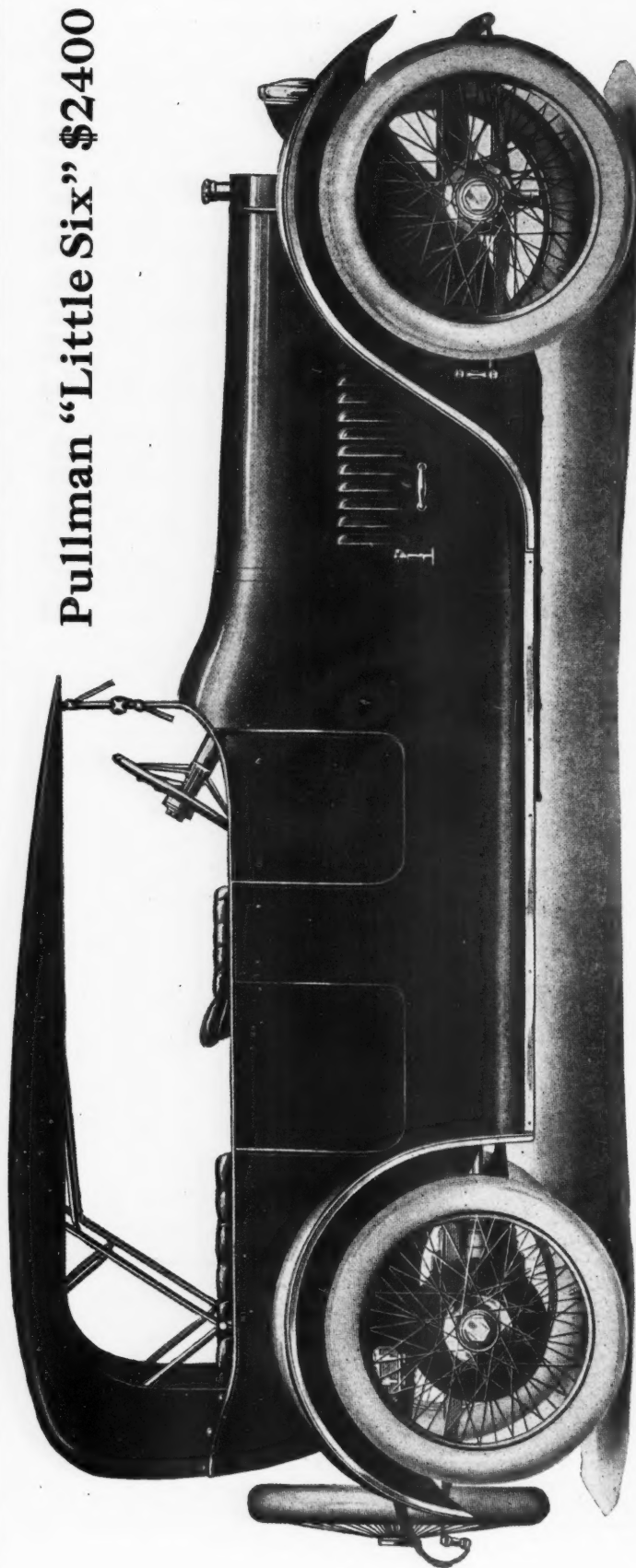
Headlights are Gray & Davis best quality parabolic lamps.

The windshield is of new design, ventilating, clear vision and rain vision.

Rims are detachable demountable, with one extra rim and tire carriers at the rear.

Electric horn, robe rail, and tool box are also furnished with the four.

Pullman "Little Six" \$2400



Absolutely an Electrically Controlled Gasoline Automobile

The Only GENUINE STREAMLINE MOTOR CAR Built in This Country

SPECIFICATIONS IN BRIEF OF THE PULLMAN

Motor— $3\frac{3}{4} \times 5\frac{1}{4}$.
 Lubrication—Combination pressure and splash.
 Oil Sight Feed and Gasoline Gauge.
 Bosch dual ignition.
 Four Speed transmission.
 Spicer universal joints, Encased in Metal.
 Straight Line Drive.
 Timken Axles.
 Gasoline Tank in Cowl.
 German Silver cellular radiator.

Extra Long rear and front springs.
 Tires— $36 \times 4\frac{1}{2}$ in.
 One spare wheel.

Left Hand Drive.
 Steering gear, adjustable, with ball thrust bearings.
 19 in. rubber covered steering wheel.
 Wheelbase—130 inches.
 Motor driven electric horn.
 Mechanical tire pump.
 Speedometer.

"LITTLE SIX"—EQUIPPED WITH VULCAN ELECTRIC GEAR SHIFT AND WIRE WHEELS
 Combination dash and trouble lamp.
 Voltmeter.

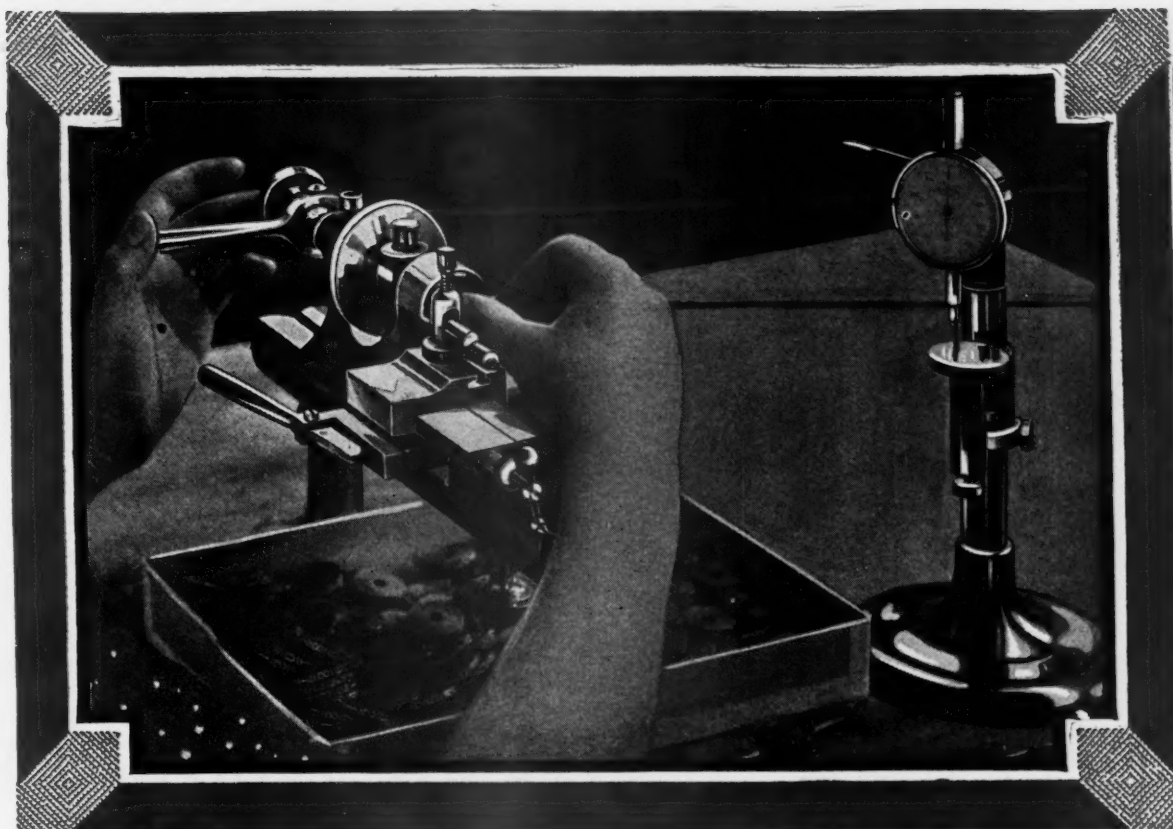
Pullman special designed top, rigidly fastened to windshield.
 Collins patented curtains.
 Pullman special designed clear and rain vision windshield.
 Turkish upholstery.
 Tool Box under front seat.
 Clean running boards.

WESTINGHOUSE ELECTRIC LIGHTING AND STARTING SYSTEM REGULAR EQUIPMENT ON ALL PULLMAN MODELS

Other Models—4-36, \$1775; 4-44, \$1975; 6-66, \$2850

DEALERS: Write or Telegraph Reservations TODAY

PULLMAN MOTOR CAR COMPANY, York, Pa.



WARNER

QUALITY AUTO-METER



Skilled Hands and Black Diamonds

HAVE you ever wondered at the unfailing accuracy with which the Warner Auto-Meter records every turn of the wheel for hundreds of thousands of miles? Such absolute accuracy is only obtainable by our high-priced manufacturing methods.

Take for example the machine for making the little dial that makes up the odometer.

On this machine are prepared the odometer discs which we import from Europe. Each disc is accurately "tailored" with a black diamond cutting point. Only the most skilled hands are engaged at this task.

We use a tool with a black diamond cutting point because it is the only one thus far discovered which will mold the exceedingly hard, durable and lasting substance.

This operation is performed on delicate watchmakers' lathes.

At the right of this picture is a gauge used to measure the thickness of the dials to 1-10,000th of an inch. Each must measure absolutely accurate in every detail.

Throughout every detail of their manufacture, this same minute care is given each Warner Auto-Meter.

You can have a Warner on the car you buy if you ask for it.

The Warner Auto-Meter Factory, Dept. 1, Beloit, Wis.

Stewart-Warner Speedometer Corporation



The
A.V.
(A. VERMERSCH)
& CIE

**The Small, Compact,
Efficient, Hydraulic-Spring
SHOCK ABSORBER**

"Made like a gun" *"Rides like a motor boat"*

At last a hydraulic-spring shock absorber that is only 6" high and produces the maximum of car economy and comfort.

The A.V.
(A. Vermersch & Cie.)
Shock Absorber
Front and Rear

For both pleasure cars and commercial vehicles. A combination of the best features of hydraulic and spring shock absorbers, together with the most advanced improvements.

\$35 to \$55 Per Pair

Made in France and sold with remarkable success throughout Europe.

We are arranging exclusive agents in each town and city. Write or wire while the opportunity is open.

HUDSON EXPORT & IMPORT CO.

140 West 42nd Street

NEW YORK CITY

RHINELAND MACHINE WORKS CO.

1254 Michigan Avenue, CHICAGO, ILL.
650 Woodward Avenue, DETROIT, MICH.

JOHN V. WILSON COMPANY

1424 Vine Street, PHILADELPHIA, PA.
220 Motor Mart, BOSTON, MASS.

When Writing to Advertisers, Please Mention Motor Age.

EMIL MEINERT PRESIDENT

GEO. MEINERT, SEC'Y AND TREAS

HAWKEYE MOTOR

THIS IS AN ORDER

AGENTS
FORMOTOR
CARS

RECEIVED

SEP 25 1913

ATTENDED TO

DAVENPORT IOWA

Sept. 23.13.

Hudson Export & Import Co.,

New York City, N. Y.

Gentlemen:-

We beg to advise that we have just received the pair of shock absorbers which you shipped us several days ago and are certainly highly pleased with them. They make the car ride with far greater ease and comfort than anyone not having used them could ever anticipate. We are convinced that it is the best shock absorber we have ever used on any car since we have been in the automobile business which has been a considerable length of time. Please enter our order at once for another pair to be used on the front of this car of which we have already given you specifications.

Yours very truly,

GEO. MEINERT
HAWKEYE MOTOR COMPANY

SEC'Y.

GM-ALH.

*Mr. Meinert is a live dealer
in a live town.
Read what he says about
the A.V. Shock Absorber.*

There are 102,965 Motor Cars owned by 265,000 Digest subscribers. These facts are presented in convincing form, a copy of the circular will be mailed on request. Families owning cars are the best possible prospects for new cars and the reason for the vast amount of automobiles advertising in the Digest is apparent.

Automobile Advertising in The Literary Digest First Eight Months of 1913

The Abbott Motor Company	- -	1260 Lines
Anderson Electric Car Company	-	1708 "
Baker Motor Vehicle Company	-	840 "
Borland-Grannis Company	- -	448 "
Cadillac Motor Car Co.	- -	2520 "
Chalmers Motor Company	- -	1904 "
Cutting Motor Car Co.	- -	224 "
Elkhart Carriage & Harness Co.	-	168 "
Franklin Automobile Company	-	2940 "
The Garford Company (Garford Car)	-	2940 "
Haynes Automobile Company	- -	1680 "
Hudson Motor Car Company	- -	2940 "
Hupp Motor Car Co. (Hupmobile)	-	1568 "
Jackson Automobile Company	- -	1708 "
Locomobile Co. of America	- -	1260 "
Lozier Motor Company	- -	1680 "
The Maxwell Motor Company	- -	420 "
C. H. Metz	- - - -	140 "
Michigan Motor Car Company	-	1260 "
Mitchell-Lewis Motor Car Company	-	420 "
National Motor Vehicle Company	-	617 "
Nordyke & Marmon Company	-	1260 "
Norwalk Motor Car Company	- -	420 "
Oakland Motor Car Company	- -	420 "
Olds Motor Works	- - - -	1680 "
R. M. Owen & Co. (Reo Motor Car)	-	2940 "
Packard Motor Car Company	- -	1680 "
Pierce-Arrow Motor Car Company	-	2100 "
Rauch & Lang Carriage Company	-	896 "
The Velie Motor Vehicle Company	-	420 "
The Waverley Company	- - -	840 "
The Willys-Overland Company	-	2940 "
The Winton Motor Car Company	-	840 "

Total - 45,081 Lines

The greatest number of automobile and truck accounts (January-August, 1913) are credited to THE LITERARY DIGEST. Forty-four (44) different makes have advertised with us in these eight months.

Motor Truck Advertising in The Literary Digest First Eight Months of 1913

American Locomotive Company	-	420 Lines
Anderson Electric Car Company	-	840 "
Electric Vehicle Association of America	-	560 "
Federal Motor Truck Company	-	1316 "
The Garford Company	- - -	420 "
General Vehicle Company	- -	280 "
Gramm Motor Truck Company	-	840 "
International Harvester Company	-	448 "
International Motor Company	-	1260 "
Kelly-Springfield Motor Truck Co.	-	420 "
Packard Motor Car Company	- -	840 "
M. Rumely Company	- - -	420 "
The Waverley Company	- - -	420 "
The White Company	- - -	3360 "
Willys-Overland Company (Utility Truck)	- - - -	840 "

Total - 12,684 Lines

Standing of Magazines in Motor Truck Advertising First Eight Months of 1913

Literary Digest	- - - - -	12684 Lines
Collier's	- - - - -	9277 "
Life	- - - - -	8008 "
Post	- - - - -	7256 "
World's Work	- - - - -	2912 "
System	- - - - -	2744 "
Review of Reviews	- - - - -	2688 "
Leslie's	- - - - -	2400 "
Country Life	- - - - -	896 "
Scribner's	- - - - -	672 "
McClure's	- - - - -	672 "
Everybody's	- - - - -	672 "
Christian Herald	- - - - -	558 "
Cosmopolitan	- - - - -	224 "
Munsey's	- - - - -	112 "

Summary First Eight Months of 1913

Automobile Advertising in The Digest	-	45081 Lines
Motor Truck " " " "	-	12684 "
Tire Advertising in The Digest	- - -	28095 "
Accessory " " " "	- - -	22051 "

Total - 107,911 Lines

The Literary Digest

When Writing to Advertisers, Please Mention Motor Age.

What a Five-Year Test Told

Cleveland- Canton Automobile Springs

We knew when we adopted Chrome-Vanadium Steel that it would outlast any other steel made. In five years, not ONE Cleveland-Canton Chrome-Vanadium Spring was returned because of breakage or settling!

Such a record is unparalleled, perhaps, in the annals of motordom.

And such springs should be your choice, if you are satisfied with nothing short of the most lasting, most resilient, most serviceable springs.

Chrome-Vanadium Steel is cross-rolled. Thus it is treated both longitudinally and transversely. And it is free from the flaws which are impossible to eradicate from steel treated in any other manner. It outwears ordinary springs as cement outwears wood.

Cross-Rolled Chrome-Vanadium

"Not a
Bump in
One of
Them"



"Built for
Life-Long
Endurance"

Jolting, vibrating springs will rapidly rack an engine to pieces.

You want springs that absorb shocks, stand terrific strains, that give protection to the delicate parts of an engine. For such springs are cheapest in the long run.

You get this service in Cleveland-Canton

Springs. You get springs that have stood the test, springs that prolong the life of the engine, retard depreciation, and put off the evil day of repair.

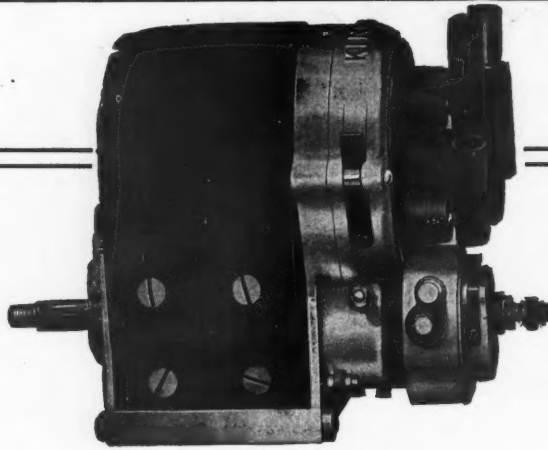
If you can get springs like these, isn't it worth while to find out more about them?

Write for blue-prints, estimates and full particulars.

Best Grade—Chrome-Vanadium
Next Best—Special Analysis

The Cleveland-Canton Spring Co.
Canton, Ohio, U. S. A.





Model "B" Magneto

A Kingston Magneto for Every Motor

REGARDLESS of what style, size, or make your motor may be—whether it be adapted to slow-running or high-speed—you will find a KINGSTON Magneto which will meet with its every service requirement in a superlative degree.

Today it can be truthfully said that KINGSTON engineers have completely blanketed the magneto situation. So comprehensively have they specialized with the needs of distinct classes of motors in view, that "A KINGSTON Magneto for Every Motor" has become a watchword for the guidance of both motorist and manufacturer.

Tell your ignition troubles to our Service Department. Their wide experience will enable them to solve that very problem which has been fretting you. Write us.

KINGSTON Ignition Specialties include spark plugs, make-and-break coils, dash coils, box coils, motorcycle coils, switches and other ignition devices, every one of which is guaranteed to give perfect satisfaction.

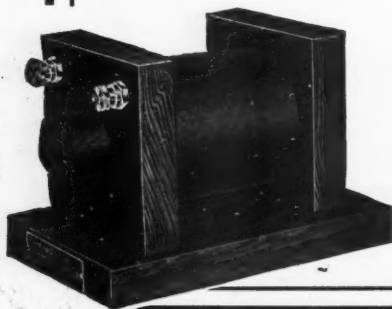
WRITE FOR CATALOG

KOKOMO ELECTRIC COMPANY KOKOMO, INDIANA

BRANCHES:

Chicago, 1430 Michigan Avenue
Detroit, 650 Woodward Avenue
Seattle, 718-20 Central Building

New York, 1733 Broadway
Los Angeles, 332 Pico Street

Covered Vibrator
Box CoilA. L. A. M. Standard
Plug

Special Block Make and Break Coil



Dash Board Transformer



Kingston Switch

When Writing to Advertisers, Please Mention Motor Age.

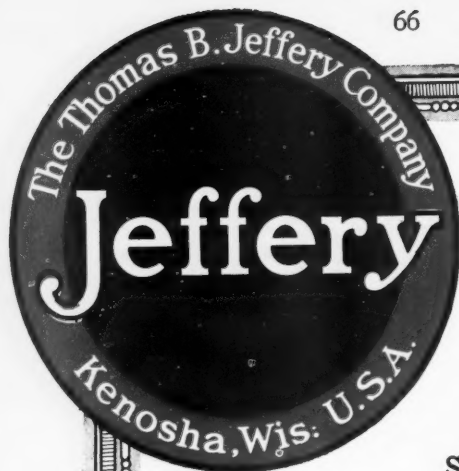


THE unquestioned position of this company, and of its product in the world at large, is due to the energy, ability and life work of the late Thomas B. Jeffery.

To the end that his name may remain in the memories of men, we have named our new car the Jeffery. We believe it to be entirely worthy of the name we have given it.

The Thomas B. Jeffery Company

Charles B. Jeffery
President



A Remarkable Car at a Remarkable Price—\$1550

High Speed Powerful Mono-bloc Motor—Four Speed Transmission—Imported Annular Ball Bearings—Full Floating Rear Axle—Short Turning Radius—Vibration Eliminated.

Light Weight and Economy Through These Features

From Nothing to Forty Miles an Hour In Twenty Seconds

The Jeffery Four is an absolutely new car, so modern and so superior that it can rub shoulders with the best cars the world produces, and profit by comparison. It is a strictly high grade car, built in accordance with the latest European and American practice, but sold at an extremely low figure—\$1550.

One big motor car dealer said when he saw it, "It can't be done. You can't build a car like that to sell for \$1550—it's too good." We proved to him that it could be done by a manufacturer with the experience, capital and equipment. Three days later he wired us an order for eight hundred cars.

The astonishing story of this car is really the story of a great independent factory backed by forty years of manufacturing experience and five and one-half million dollars in assets.

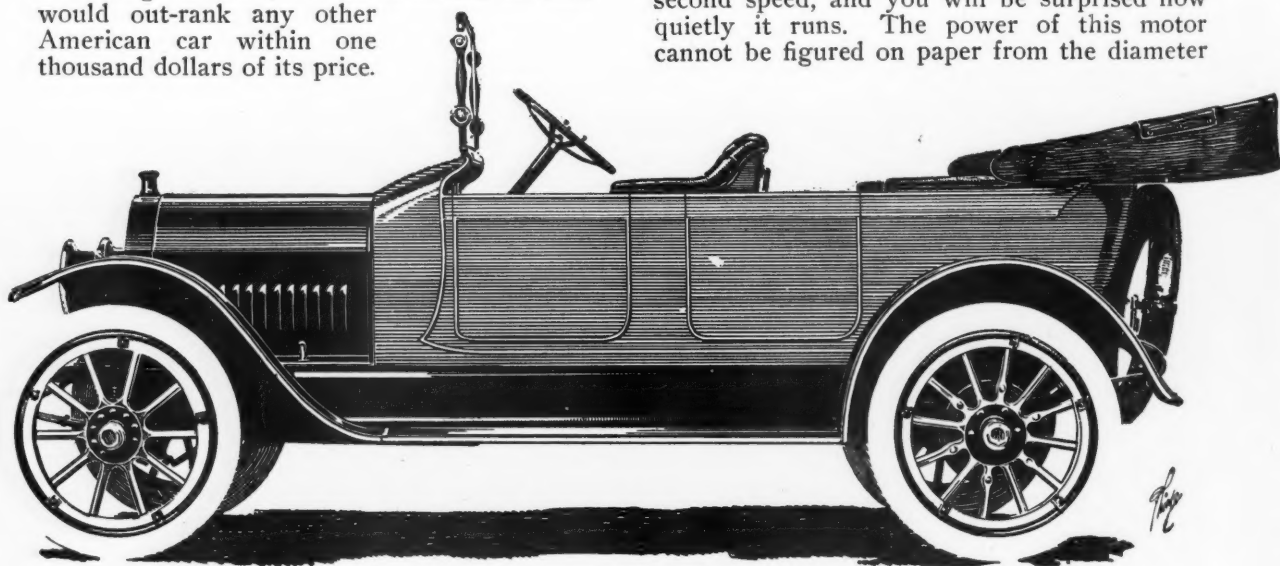
Two things we determined to give to this car without sacrificing a third. We knew that if we could accomplish these two things without losing the third, we would have a car that would out-rank any other American car within one thousand dollars of its price.

We gave it light weight and light running qualities without sacrificing comfort. Think what these things mean—less fuel consumption, less vibration, less repairs, less tire expense and real pleasure for the owner.

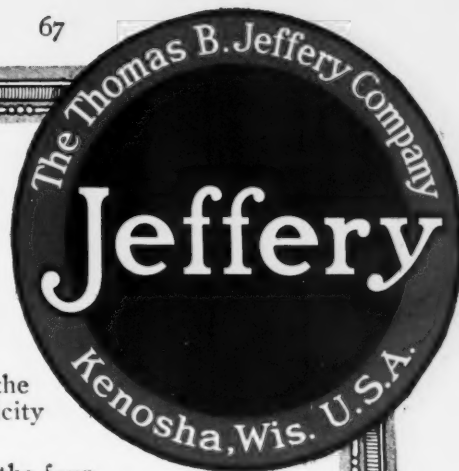
We began with the motor. Jeffery engineers took to pieces every successful European and American motor before deciding upon this high speed, mono-bloc design. From all these we took the best features, combined them with our own ideas and the result is a remarkable motor—powerful, light and economical.

This high speed, mono-bloc motor is compact and simple. It develops, at 2200 revolutions per minute, forty horse power. The cylinders, $3\frac{3}{4}$ inch bore and $5\frac{1}{4}$ inch stroke, are formed in one remarkable solid casting, together with the valve seats and water jackets. This makes it strong, without vibration and easy to cool.

It can travel forty miles per hour on second speed, and you will be surprised how quietly it runs. The power of this motor cannot be figured on paper from the diameter



The Jeffery Four, \$1550



of the cylinder or the length of the piston stroke. It takes motor speed to make power and, when delivered to the rear axle through mechanism which is almost entirely free from friction, the result is wonderful.

The reciprocating parts of the motor are made as light as possible, consistent with strength. The pistons, together with the wrist pins and piston rings, weigh but three pounds each. Usually pistons weigh from four and one-half to seven pounds each.

This motor gets away with snap and go—the kind you like to feel. Touch the throttle and in seven seconds you are making twenty miles an hour, in twenty seconds forty miles an hour—fifty miles per hour in fifty-five seconds.

The oiling system is the latest. It is a combination of the internal force feed and constant level splash systems. A reservoir under the crank case contains the supply of oil.



Direct front view of Jeffery Four

The oil pressure gauge on the dash, or the indicators on the crank case, will tell you instantly what is going on.

The electric starting and lighting system is the U. S. L. All manufacturers know that this is the most expensive made and is protected by exclusive patents. We know by experience that it is the best. Another car selling for \$3250 charges \$200 extra for this equipment. The Jeffery car could be sold for \$100 less if equipped in any other way.

Not a gear, cam, chain or bearing is used in this starter's construction—that's what makes it so quiet. None of that grinding noise you notice in the common starter.

Not a single car in America selling under two thousand dollars, except the Jeffery Four, is equipped with the U. S. L.

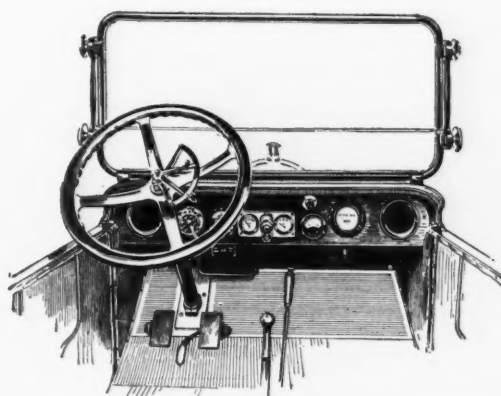
An English motor car manufacturer investigating starters in this country said in *The Autocar*, the leading English motoring publica-

tion, that in two years the gear driven starter would be obsolete.

The clutch is a perfected cone, leather faced with spring inserts.

Every mechanic knows the effectiveness and simplicity of this type.

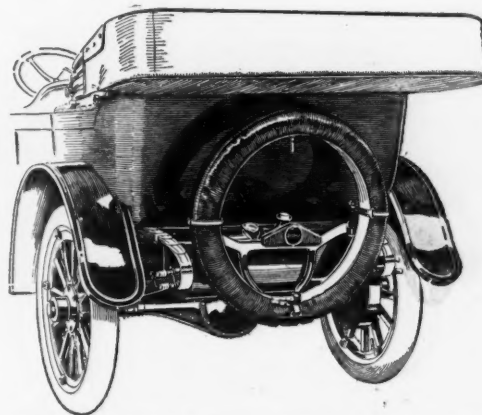
Between the clutch and the four speed transmission there is a feature absolutely new to American cars—the famous Daimler flexible leather coupling. Daimler introduced it first in his large omnibuses in use throughout Europe. We tested it for thousands of miles before adopting it on the Jeffery car.



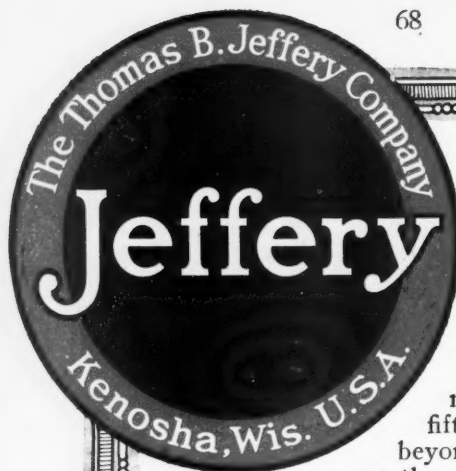
*Forward dash of the Jeffery Four
All attachments set in*

The transmission with four speeds forward and one reverse, weighs less than one hundred pounds. It's the last word in flexibility of control and ease of operation.

The transmission case is solidly bolted to two cross members of the frame and located amidships, providing center control and left hand steer, thus conforming to that greatest influence—public opinion.



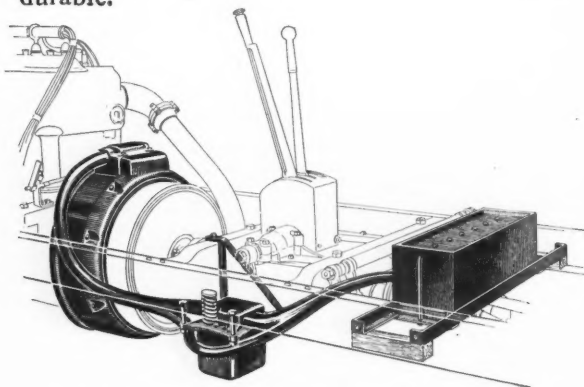
Rear of Jeffery Four. Pressure Gasoline Tank rigidly attached to extended frame members



The transmission shafts are of vanadium steel hung in five imported annular ball bearings.

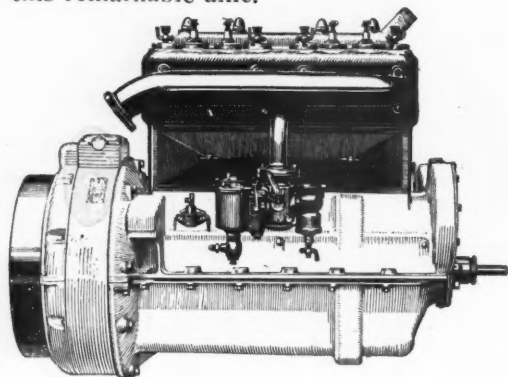
We are proud of our transmission gears. We make them ourselves and the fifty-two tooth bevel gear is, beyond question, the most correctly cut gear in America today.

Ask any mechanic about Spicer universal joints. Two of these are located between the transmission and the rear axle. The drive shaft is many times stronger than the heaviest strain you could ever place upon it. Made of the finest chrome nickel steel, heat treated, it is the most expensive we can buy. These joints are fully housed, light, well lubricated and durable.



U. S. L. starting and lighting system directly connected.
No chains, gears or belts

The rear axle is of full floating type, fitted with imported annular ball bearings—the same quality axle as those used on all highest priced electric vehicles. Few American built gasoline cars have been able to adopt them on account of their cost. Consider, if you can, the frictionless passage of power from the high speed, well balanced motor through the leather coupling, into the four speed transmission, rolling smoothly on imported annular ball bearings, and back through the Spicer universal joints to this remarkable axle.

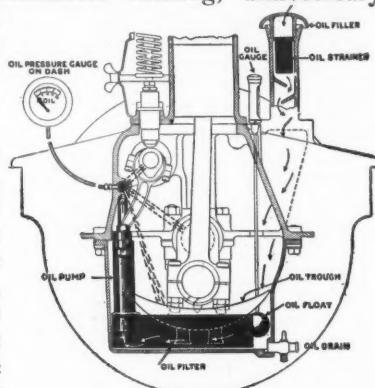


Jeffery Four high speed mono-bloc motor

What is the result? You can speed up this car to forty miles per hour, shut off the motor and coast half a mile. The mere pressure of forty-five pounds will start it rolling on the floor. Not a ball bearing in it that has not been submitted to at least three engineers for an opinion as to size. Light running—of course—economy again, you see.

There are two brakes—a service, and an emergency brake, each of internal expanding type. This eliminates rattling, unnecessary parts, and keeps them free from dust, grit and mud.

Owing to compactness, we have been able to reduce the wheel base to 116 inches, yet we have retained the comfortable lines of the body, cutting out weight and again reducing upkeep.



Jeffery oiling system

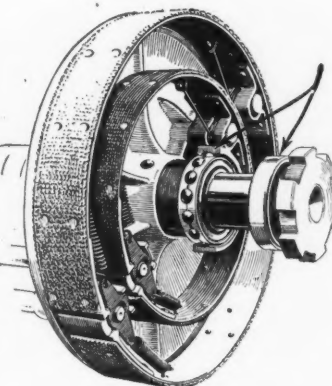
For this wheel base we have provided 34x4 inch wheels, equipped with demountable rims. Short turning space is provided. The Jeffery Four will turn in a forty-two foot circle.

The springs are of vanadium steel, two inches wide and fifty inches long, scientifically heat treated. We use vanadium steel because of its longer life and greater elasticity.

The front axle of vanadium steel is a marvel of lightness and strength. It weighs but twenty-nine pounds, but it took thirty-two thousand pounds to twist it in our torsion test machine. The radiator holds five and one-half gallons of water and has over ten thousand square inches of cooling surface. Circulation is by centrifugal pump.

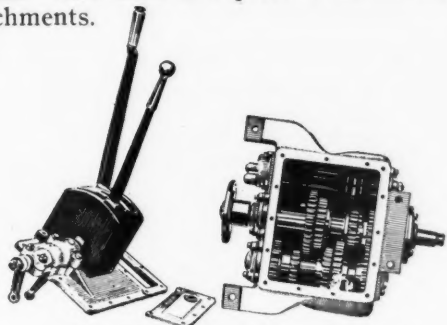
Rothschild designed the body. It's an improvement on the Lancia—that beautiful Italian car. It is Brewster green in color.

If we did not have a press of fifteen hundred tons capacity we could not manufacture this body and put it on a car at \$1550. Sixteen dies were used in making the body alone, and the die for the cowl took three months to build.



Jeffery Four brakes showing imported annular ball bearings

The upholstery is of the finest leather and hair. The doors are extremely wide, 23½ inches. The dash is replete with all modern attachments.

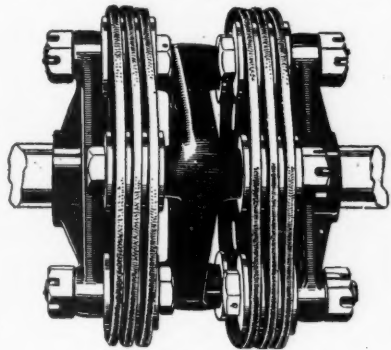


Four speed transmission and levers

The hinges on the door are of the patented invisible type. The back of the front seat is finished in the finest leather.

A pressure-feed gasoline tank with gauge carried behind, and with pump operated from the cam shaft, insures an even flow up hill or down. An auxiliary pressure pump is located on the dash, both for oil and air emergency.

The electric light switch attachment is the most clever arrangement of its kind yet devised. The lights can be dimmed at any time for city driving. The equipment includes top of finest material, rain vision wind shield, Stew-



Jeffery leather universal

art-Warner speedometer, ammeter, extra demountable rim with brackets, electrically lighted dash, Klaxet horn, Solar electric lamps and complete tool equipment. Power tire pump, \$25 extra.

The Jeffery Six

The Jeffery Six is a duplicate of the wonderful Jeffery Four, except for size, and the fact that the cylinders are cast in pairs.

This car, which sells at \$2250, has all the best features of all the best cars. We built it for the man who demands Jeffery quality in a six.

It is light—actual scale weight 3700 pounds—with full equipment. We made it luxurious without making it extravagant.

It is a beautiful car and a delight to drive. It is smooth, flexible and responsive. We know that a better Six cannot be built for the simple reason that parts of better quality have yet to be produced.

High Grade Features of Jeffery Six

Forty-eight horse power motor, cylinders cast in pairs, 3¼x5¼.

Extra large bearings.

Bosch Duplex ignition.

Rayfield carburetor.

Imported annular ball bearings throughout.

Four forward speed transmission.

Warner auto meter.

U. S. L. starting and lighting system.

Power tire pump.

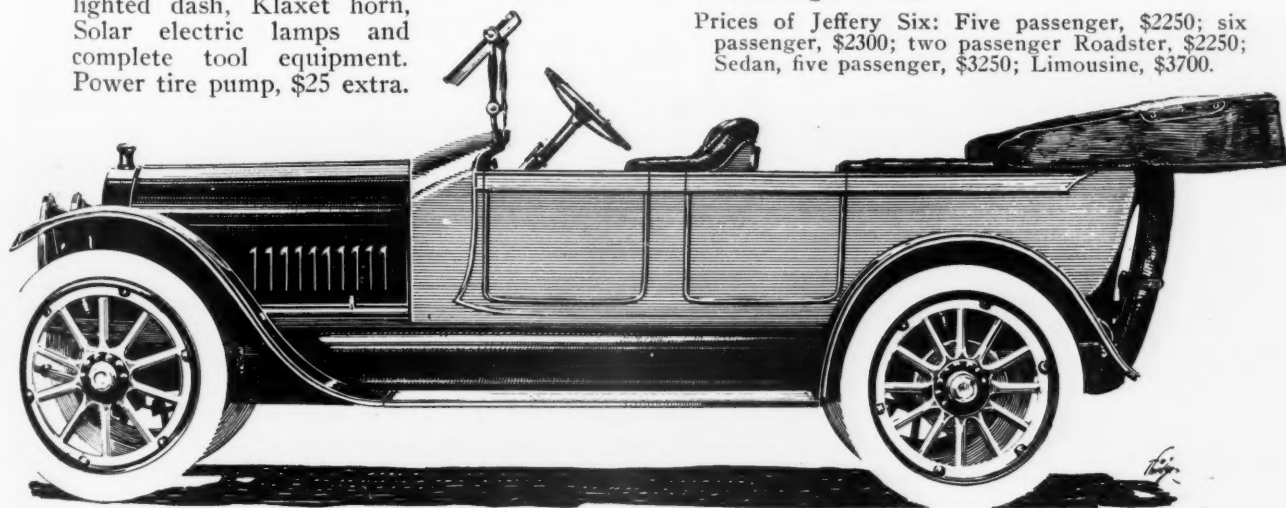
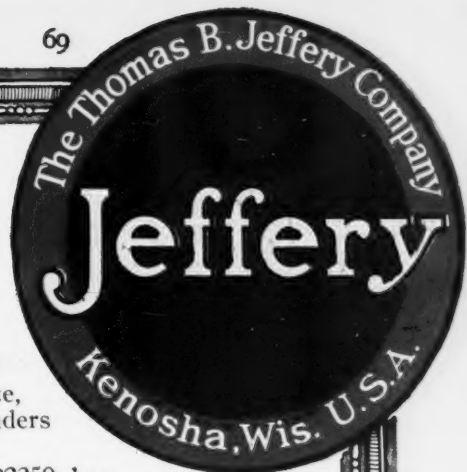
Wheels and tires 36x4½. Sedan and Limousine 37x5 inch tires. Wheel base 128 inches. Demountable rims.

Rothschild body with extra wide doors and low, deep seats.

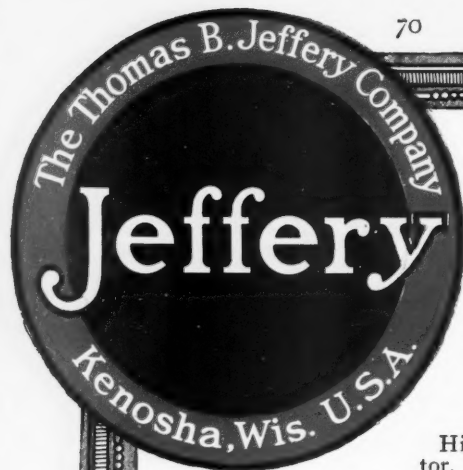
Pressure feed gasoline tank with gauge.

Full floating rear axle.

Prices of Jeffery Six: Five passenger, \$2250; six passenger, \$2300; two passenger Roadster, \$2250; Sedan, five passenger, \$3250; Limousine, \$3700.



The Jeffery Six \$2250



Fifteen Jeffery Four Features

High speed mono-bloc motor, European type. From nothing to forty miles an hour in twenty seconds—high grade.

U. S. L. starting and lighting system—high grade. This car could be sold for \$100 less if equipped in any other way.

Imported annular ball bearings throughout—high grade. Standard on the world's best cars.

Spicer universal joints—high grade. Ask any mechanic.

Combination force feed and splash oiling system—high grade. The most economical we know.

Four forward speed transmission—high grade. Control levers directly over transmission.

Full floating type rear axle on imported annular ball bearings—high grade. Same quality as that used on all highest priced electric vehicles.

Body designed by Rothschild of New York—high grade. The hit of the Paris show.

Leather universal between clutch and transmission—high grade.

Vanadium steel springs and front axle—high grade.

Rayfield carburetor—high grade.

Left drive and center control—high grade.

Pressure feed gasoline tank in rear, and pump operated through cam shaft—high grade.

Bosch Duplex ignition—high grade.

Solar Lamps—high grade. Operated by four-position switch—the simplest ever made.

Prices of Jeffery Four

Built in five body styles. Five passenger touring, \$1550. Two passenger roadster, \$1550. Two passenger Coupelette, enclosed, inside drive, \$1950. Four passenger Sedan, enclosed, inside drive, \$2350. Five passenger limousine, \$3000.

Dealers have already ordered over fifty per cent of our output.

Five and one-half million dollars in assets, with the highest credit in the industry, and a factory equipped with three million dollars' worth of the latest machinery, and manned by a loyal body of workmen, are the things that made the Jeffery Four and Six possible.

Few manufacturers in the industry can produce a car like the Jeffery Four to sell for \$1550, and make a cent of profit—except Jeffery.

True, the margin will be small, but the sales will be enormous and the quantity production large. We will be satisfied with the profit because the owner will be satisfied with his car.

Although this is the first public announcement of the Jeffery Four and Six, dealers have already ordered more than fifty per cent of our output for the coming year. One dealer, recognized as the leader in his section of the country, when he heard of the new cars, traveled fifteen hundred miles to ask for the right to sell them.

Big dealers in big cities all over the country are dropping other lines or organizing new companies to take on the Jeffery line. They were quick to recognize in this car a wonderful opportunity. They know that only a concern with the capital, equipment and experience of the Jeffery Company can produce such a car at such a price.

Deliveries have already begun and the output is increasing daily. The orders for immediate delivery have reached a high figure, but the factory can handle the demand.

Successful dealers want to become associated with a financially strong and successful organization.

Wire or write immediately for territorial reservations.

The Thomas B. Jeffery Company

Kenosha, Wisconsin

"American" Axles

**An Ideal Mounting For That Form of Worm Drive
Which Has Been Universally Accorded First Place**



In every field of industry there is one acknowledged leader, by which all others of its type are judged.

The Lanchester-Daimler Worm Drive holds this enviable position among gears of its class, because its superior efficiency is not a mere claim, but the verdict of expert engineers, based upon exhaustive practical tests covering many years of service.

Since we secured the sole American rights as axle manufacturers to this gear—some two years ago—we have actually added to the wonderful efficiency it displayed abroad, through the perfection of mounting which *"American"* Axles have given it.

By offering manufacturers of high grade gasoline or electric pleasure cars the option of the Lanchester-Daimler Worm Drive, or our own Bevel Drive Axle, we doubled our opportunity for service just when the worm drive became the most important subject connected with automobile construction.

The Lanchester-Daimler Worm Drive, mounted in a full-floating *"American"* Axle and fitted throughout with the finest of foreign made ball-bearings is, therefore, a unit whose every part has been conclusively tested, and which in its complete form is, we believe, the best axle of its class in the world.

The adjusting and full-floating features of *"American"* Axles are fully covered by our own patents and by shop rights from other patentees

The American Ball-Bearing Company, Cleveland, Ohio

INVADER OILS



¶ Do not forget that the quality of any given lubricating oil is something concerning which there can be no intelligent difference of opinion.

¶ This is for the simple reason that all oils are susceptible of being chemically tested, and the amount of heat they will stand together with the amount of carbon they will deposit, can be actually measured and expressed in figures that cannot be contradicted.

¶ If the leading engineers of the automobile industry would only take up the question of lubrication in a scientific manner—if they would only disregard snap judgments given by men in the testing department, and substitute therefore an intelligent investigation of the question so that they would know which oils were good and which were bad—we would sell a whole lot more Invader Oil than we do now, and there would be a big improvement in the other oils now on the market.

*Territorial agents are in a position to fill orders as
or any branch of the Invader*

FACTORIES:

NEW YORK.....92 Pearl St.
PHILADELPHIA.....113 Arch St.

BRANCHES:

BOSTON.....284 Columbus Ave.
WASHINGTON.....512 Kenois Bldg.
PHILADELPHIA.....113 Arch St.

INVADER

Lessees of Chas.

Main Office: 79 BROAD

Store, 1906 Broadway,



INVADER OILS

¶ It is perfectly obvious, for instance, that a high gravity oil is better than a low gravity oil (Baume scale) if the oils are equal in other respects. It is equally obvious that a light colored oil is better than a dark colored oil if the oils are equal in other respects.

¶ Invader Oils have the same range of fire tests and the same range of bodies that other oils have, but they are lighter in color and higher in gravity.

¶ This simply means that Invader Oils are freer from carbon than other oils of equal body and consistency.

¶ This is not true because we say so or because the oil is our product or because we are anxious to sell it. It is simply a concrete fundamental chemical truth that cannot be contradicted.

promptly and at the same prices as the main office
Oil Co. Write for prices.

OIL COMPANY Inc.

F. Kellom & Co.

ST., NEW YORK
NEW YORK

TERRITORIAL AGENTS:

Los Angeles, Cal.	W. D. Newerf Rubber Co.
San Francisco, Cal.	W. D. Newerf Rubber Co.
Tacoma, Wash.	Union Motor Car Co.
Omaha, Neb.	Lining Implement Co.
Detroit, Mich.	Boyer-Campbell Co.
St. Louis, Mo.	Beck & Corbitt Iron Co.
Chicago, Ill.	Motor Car Supply Co.
Salina, Kansas.	Lee Hardware Co.
Kansas City, Mo.	American Lubricating & Supply Co.
Portland, Me.	James Bailey Company

Know
These
Springs
By This
Trade
Mark

RESILIENT

Detroit Springs

SILENT = SELF-LUBRICATING

Look for the
Lubricating
Cup near End
of Each
Leaf

The *Extra* Quality of Detroit Springs *pays*. It pays *us*—in steadily increasing good will on the part of the motoring public and car manufacturers. It pays the *car manufacturer* in the reputation it gives his car for easy riding. It pays the *motorist* in comfort, in safety.

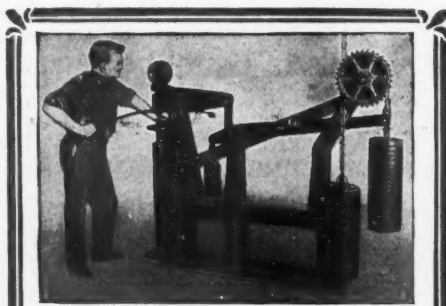
Extra quality pays. More than that, we do not exaggerate when we say that this extra quality of Detroit Springs is the *only* quality you car owners can afford to buy. It is the only quality which car manufacturers dare choose for their machines.

Less than the extra quality of Detroit Springs is a compromise with discomfort, a compromise with the needless wear of expensive mechanism through jolt and jar, a compromise with the positive danger to life and limb from broken springs.

The Life of the Car—Its Comfort—Safety—Service—Depend on the Springs. So *specify Detroit Springs*—demand them on your car for their extra safety, comfort and long service.

Naturally, springs made to the D. S. P. Standards cost the automobile maker more. But the insurance against accidents alone is worth it. An additional income is the saving in repairs to car and tires. No conscientious manufacturer ignores such powerful aids to the prestige of his car and the satisfaction of his customer.

Consider the increased comfort. You must realize that both tires and upholstery are stripped of a large measure of their value unless assisted by resiliency such as Detroit Springs afford.



THIS man is testing Detroit Springs for hardness. Every individual leaf of the Detroit Spring on your car has passed this test successfully. Two other crucial trials of entirely different characters are required before the springs are entitled to their position as guardians of your safety—factors for your comfort and the long life of your car. Write for the booklet that explains these tests and the interesting processes that lead up to them.

Get the Springs Guaranteed for Two Years. Our positive two-year guarantee to the car maker

covers the replacement of every Detroit Spring, either broken or settled, delivered to us f. o. b. Detroit. This guarantee protects you against defective material or workmanship for two years from the date of manufacture stamped on the short leaf of each spring.

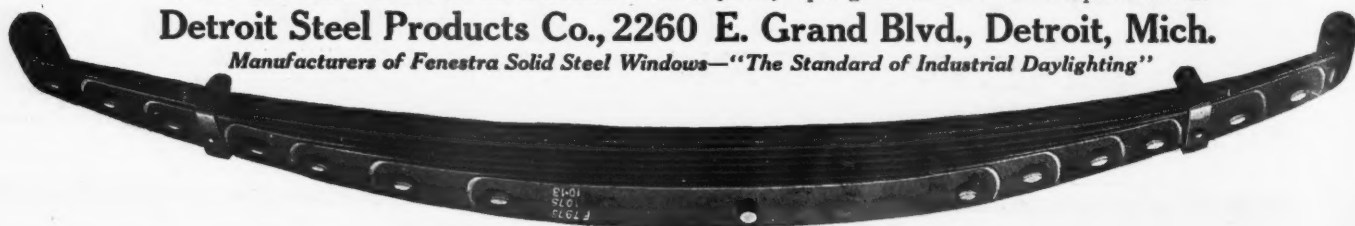
We are safe in so doing. Our tests assure us that the Detroit Springs you get will outlast the guarantee. Before they leave the factory they have passed through strains that your car never can equal. The "Initial Test," the "Hardness Test," the "Capacity Test," condense years of shock and stress into a few days.

Forty-eight processes have preceded these tests. Every process is managed deliberately, scientifically, by the masters of spring making we employ. That's why Detroit Springs pass our factory tests and the car owners' road tests with strength, elasticity and endurance to spare.

Silent, permanently resilient, self-lubricating. The new feature of Detroit Springs, the Self-Lubricating Device—patents pending—ends the dark ages of squeaking, noisy springs. Distributing cavities at end of each leaf are filled with long-lived lubricant. This lubricant feeds with every movement of the spring leaves. They slide upon each other, easily, silently.

Write for Free Booklet —the story of the entire process of manufacturing these extra quality springs and the tests that prove them.
Detroit Steel Products Co., 2260 E. Grand Blvd., Detroit, Mich.

Manufacturers of Fenestra Solid Steel Windows—"The Standard of Industrial Daylighting"



When Writing to Advertisers, Please Mention Motor Age.

We've Been So Busy Filling Orders That We Haven't Had Time To Write Advertisements

The new standard set by the Chandler has been the sensation of the year. Chandler cars have been sold before made. Offering by far the most for \$1785—a Six with greater economy than is possible even in a four, a motor unequaled in any car, and the foreign carriage type of body which is the ultimate in designing—our progress has been without parallel among motor car successes.

The unusually creditable performances of the Chandler have been our advertising. Now we announce a *new kind of advertising for motor cars, advertising which will iron out the frills and flounces and put a straight, clear "Proof Sheet" for comparison of automobile values up to thousands of prospective buyers.*

We will *prove* to the economist purchaser that here is a Six which offers the upkeep economy of cars way under \$1785 and all the advantages of the "swell cars" way above this price. The Chandler weighs less than 3000 pounds—actual shipping weight, fully equipped, 2879 pounds—just right to economize, just heavy enough to hold fast to all kinds of going. Other ideal features are the flexibility—3 to 55 on high—and low hanging construction with 10½ clearance.

Look for the first double spread in the Saturday Evening Post carrying the "Proof Sheet" November 16th. This will be followed by a heavy schedule of advertising in the Saturday Evening Post and such other magazines as Literary Digest, Life, etc.

Less than 3000 pounds in weight	LIGHT WEIGHT SIX CHANDLER \$1785	More than 16 miles per gallon gasoline
		

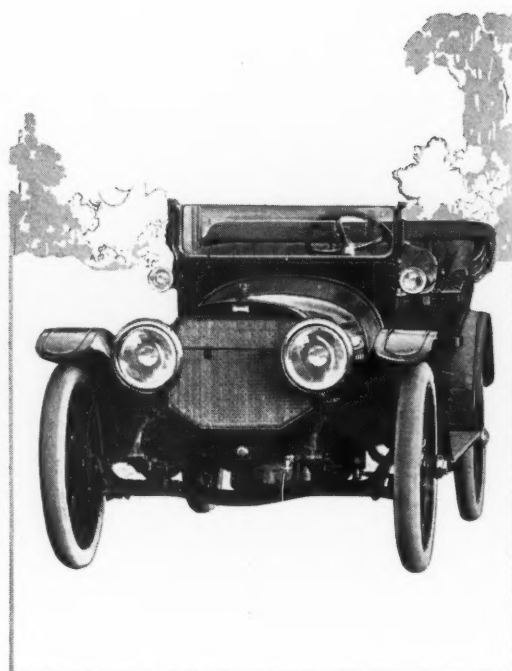
Honest Comparisons to Convince Muddled Buyers

A great many automobile buyers are at the mercy of salesmen. They *guess* when they finally purchase. We're not going to let anyone confuse them about the Chandler.

Our "Proof Sheet" will give the Price, Number of Cylinders, Weight, Gasoline Consumption, Flexibility, Hill Climbing Ability, Turning Radius, Position of Drive and Control, Make of Self-Starter, Make of Magneto and General Equipment and other features of the Chandler, leaving space for the notation of comparative figures for other cars.

These "Proof Sheets" are going to be *used*, going to be carried into automobile display rooms all over this country by thousands of purchasers.

They are going to hold advertising to truth, selling to telling, automobiles to facts—*make clear as daylight the superiority of a less-than-3,000-pound Six with 35 horsepower which runs 16 miles and more on one gallon of gasoline.*



The men
behind this
classic six
have for

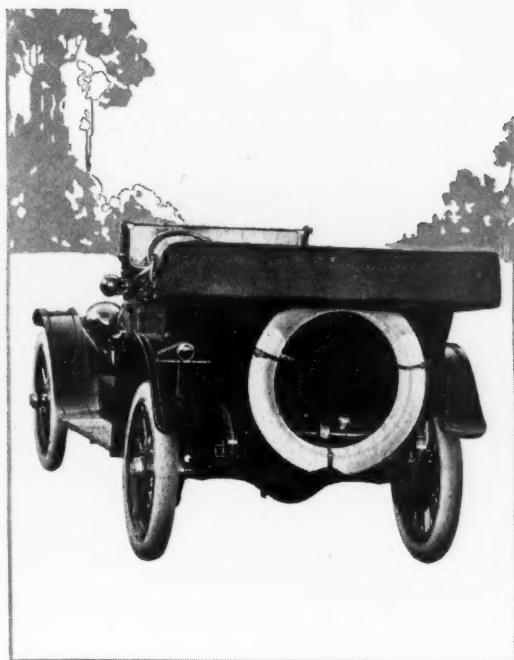
LIGHT WEIGHT SIX
(CHANDLER)
\$1785

years built
sixes of
world wide
reputation

F. C. CHANDLER, former vice-pres., general manager and director, Lozier Motor Co.
C. A. EMISE, former sales manager and director, Lozier Motor Co.
W. S. M. MEAD, former foreign sales manager and director, Lozier Motor Co.
S. REGAR, former treasurer and director, Lozier Motor Co.

J. V. WHITBECK, former engineer, Lozier Motor Co.
C. A. CAREY, former purchasing agent, Lozier Motor Co., assistant purchasing agent, Ford Motor Co.
J. R. HALL, former manager supply, repair and service departments, Lozier Motor Co.

The Chandler Has Fulfilled Every Promise - Today the Sensation of the Trade



The sale of \$4,000,000 worth of Chandlers proves that *weight* has become the big factor in motor car selling. Last winter a seasoned organization of motor-building veterans produced not just a new name but a car which was the climax of long experience in classic Six construction. The trade and the public found that a long step forward had been taken in automobile building. The scientific use of pressed steel and aluminum in place of solid forgings and castings has confirmed the belief of F. C. Chandler and his associates. They have proved that a Six can be built sturdily to weigh under 3000 pounds and thus not only equal but surpass in economy of upkeep the most economical fours.

In the Chandler, correct weight distribution with perfect spring suspension holds to any road and saves dollars in gasoline, upkeep and extra tires. Today the spectacle of a 35 H. P. Six doing 3 to 55 miles on high represents the last word in motor building, and not even an imitation is possible for a long time to come.

We're building at the rate of 3000 Chandlers a year. We wish to perfect our organization with dealers of the highest standing. If you are a leading dealer, get the Chandler this year and keep in the forefront of the motor sellers. Ask our other agents.

**Specifications
that are
different**

LIGHT WEIGHT SIX

CHANDLER

\$1785

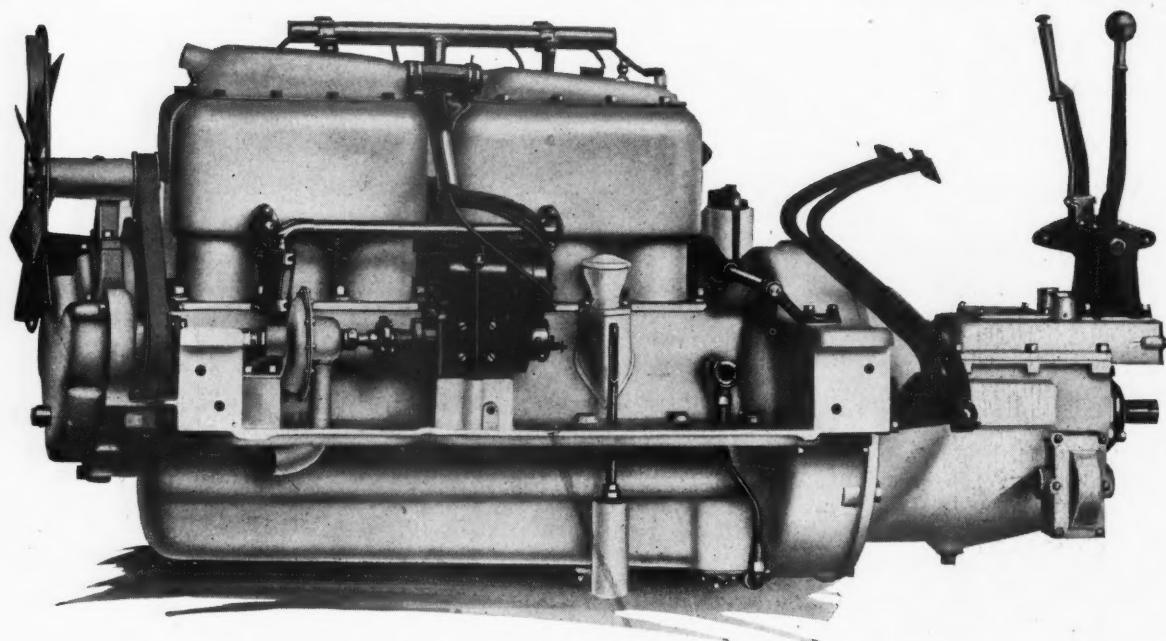
**We're
building
ten a
day**

LEFT-SIDE DRIVE—Center Control.
WHEEL-BASE—120 inches.
ROAD CLEARANCE—10½ inches.
WHEELS—Artillery type, 34x4 inches, Firestone Demountable Rims.
MOTOR—Six cylinders, 35 H. P., 3¾x5 inches, "L" Head type. Cylinders cast in two blocks. Valves enclosed.
OILING—Positive gear pump in oil-base. Oil gauge on motor base.
IGNITION—Bosch High-Tension Magneto.
CARBURETOR—Stromberg "Little Six," hot air and dash priming attachments.
SELF-STARTER—Westinghouse Electric built into motor.

COOLING—Centrifugal pump. Mayo genuine Mercedes type Honeycomb Radiator.
ELECTRIC LIGHTING—Westinghouse electric lighting generator with large storage battery. Solar lamps, illuminated license bracket.
CLUTCH—Multiple disc. Raybestos and steel ball-bearing.
TRANSMISSION—Three speeds forward and reverse.
REAR AXLE—Floating type. F. & S. Imported Ball Bearings.
STEERING-GEAR—Irreversible and adjustable. Ebonized steering wheel.
GASOLINE SYSTEM—20-gallon tank in rear. Gasoline gauge.

STREAM LINE BODY—Five-passenger coach type.
UPHOLSTERING—10-inch cushions, high-grade tufted leather. High-grade springs.
WINDSHIELD—Built in without rods or braces. Adjustable for rain vision or ventilation.
TOP—Mohair top with "Jiffy" curtains.
HORN—Genuine motor-driven electric.
JONES SPEEDOMETER.
CLOCK—8-day New Haven.
COLOR AND FINISH—Bodies, wheels, frame and running gear finished in handsome dark blue with silver stripe. Fenders, hood and cowl black. All hardware, lamps and fittings nickel-plated.

The Chandler Motor



Tops All Six Achievements

Not a stock motor, but built in our own factory—it can be obtained *only* in a Chandler car.

No motor in any car at any price equals this one. Behind that statement is the experience of many years in building famously successful sixes.

The Chandler motor has operated on remarkable schedules over rigorous roads and climbed the most awkward grades surpassing performances of others

of over 60 H.P. rating. That tough grind—Cleveland to Boston, 734 miles—was done with only once replenishing the oil, averaging 16 miles to a gasoline gallon—this by a *new* car! 748 miles were made in 25¼ hours driving time—Cleveland to Waterloo—without gear shifting.

Let us give you details of scores of other wonderful performances.

The car
you
want to
represent



Full details
agency
plan on
request

It carries with it the leadership in your territory. Besides big car value, our selling method means you will sell a larger percentage of your prospects. Inquiries mean *Actual Sales* on the

Chandler. It's the car that is purchased by the man who has owned several others. Write us for catalogue and full details of an exclusive territory proposition on the Chandler.

The Chandler Motor Car Company 211 to 231 E. 131st St. Cleveland

NEW DEPARTURE

QUALITY GUARANTEED



AMERICAN MADE FOR AMERICAN TRADE

BALL BEARINGS

The NEW DEPARTURE MFG. CO.
BRISTOL CONN.

When Writing to Advertisers, Please Mention Motor Age.

Ask Dun's, Bradstreet's Or Your Own Banker

NOW, MORE THAN EVER BEFORE, it behooves the dealer and the buyer to look carefully to the financial stability of the automobile manufacturer whose car he contemplates owning.

THERE HAVE BEEN SOME occurrences of late that should serve as a warning in this regard. On the other hand, there hasn't been a failure that wasn't scheduled. They were foreordained from the first—inevitable.

SOME WERE OVERDUE, in fact. Thanks to the splendid demand for cars, which we and other responsible concerns were unable to supply in full, some of them were accorded a longer lease of life than their product or experience or financial backing entitled them to.

THERE WAS NO EXCUSE, however, for any buyer being in ignorance of what impended. That was easily foreseen.

LET US SUGGEST that now, you who are in the market for a car look into this matter as it deserves. You owe it to yourself—and us.

ASK BRADSTREET'S OR DUN'S. Or if you are not a subscriber, ask your Banker to investigate and inform you. He will do it gladly.

ASK HIM WHICH ARE the five financially strongest automobile manufacturers.

YOU WILL FIND that the Maxwell Motor Company is one of the five—and it will not be fifth in point of stability either.

HAVE HIM ANALYZE the latest financial statements of these five strongest and tell you which have the greatest amount of assets in proportion to liabilities—including bonded indebtedness, etc., of course. We think he'll tell you the Maxwell Motor Company is one of the leaders.

PERHAPS YOU DIDN'T KNOW—there's been so much confusion in this matter—that the Maxwell Motor Company has no

connection whatsoever with the late Maxwell-Briscoe Company except that this concern purchased, through the U. S. Courts, all the assets, not only of that, but of several other concerns.

WE STARTED WITH A CLEAN SLATE—with plants worth many millions, with ample cash on hand to take care of our manufacturing operations, etc.

WE HAVE NO BONDED INDEBTEDNESS—no outstanding notes or debts of any kind except current open accounts not yet due.

AND TODAY WE ARE nine months old with orders on our books for more than thirty thousand cars.

HAS THAT RECORD EVER been surpassed in this industry? We submit the account of our stewardship—ask Bradstreet's, Dun's or your Banker for further particulars regarding the operations and stability of this Company.

THEN YOU'LL FEEL SECURE on that point and, when you compare the cars as carefully, there will be only one answer, "Yours will be a Maxwell."

THERE ARE THREE, MAXWELL MODELS—the "25" for \$750; the "35" for \$1225, with electric starter and lights; and the self-starting 7-passenger "50-6" for \$1975. A handsome illustrated booklet descriptive of each model tells How and Why we can give such values. Send today for the book on the Model you are interested in.

Maxwell Motor Company (Inc.)

Detroit, Michigan

Dealers and Service Everywhere

64,000 FORD OWNERS USE

The Master Vibrator



Price, \$15.00

AND HAVE THAT SATISFIED FEELING

because the K-W Master Vibrator increases the efficiency of their cars by giving a

**A Hotter Spark More Power
A Smoother Running Engine
Less Carbon Deposits
Easier Starting
Cleaner Spark Plugs**



An honest article at a fair price—large, powerful condenser, genuine solid platinum-iridium points of generous size, strongly built kick switch—

The Standard By Which All Others Are Judged

OUR GUARANTEE—Try the K-W Master Vibrator for 30 days and if you can get along without it, return it and we will give you your money back and ask no questions. **SEND FOR DESCRIPTIVE FOLDER**

SIMPLE, EFFICIENT AND ECONOMICAL The Electric Headlight Outfit **\$40**



Complete Outfit, Electric Generator, Headlamps, Switch, Wire and Bulbs

EASY TO INSTALL

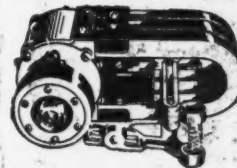
MOUNT IT IN ANY POSITION

Runs in either direction

Has only one moving part

No commutator or brushes

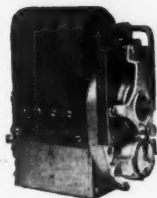
Gives two 1,600 C. P. headlights



Send for descriptive folder

We also make a

Ford Outfit For Fly-Wheel Magneto, \$15.00



The High Tension Magneto

The strongest made for the largest engine made. Positive results and entire satisfaction guaranteed. Give description of engine and ask for price. You can't make an engine too big for the K-W. No batteries needed to start.

WE PREPAY THE EXPRESS all the way on the K-W Master Vibrator and East of the Mississippi River on all our other goods when cash accompanies the order



Give the
Street Number →
Agents in principal cities.

2835 CHESTER AVE.

CLEVELAND, OHIO, U.S.A.

NEW YORK, E. J. Edmond, 1783 Broadway.

BOSTON, W. J. Forbes, 243 Columbus Ave.

The Atwater Kent Ford Ignition

does more than eliminate the frequent and troublesome adjustment of the Ford coils.

The Atwater Kent Ignition assures perfect synchronization at all speeds, eliminating preignition and overheating—starts easily with a quarter turn of the crank and frequently without cranking by means of the starting button on the coil.

Effects a saving in gas, wear and vibration by enabling the motor to run

slowly while the car is standing and run as smoothly "on high" at four miles an hour as at thirty or fifty.

The Atwater Kent will, in addition, wonderfully increase the power, speed, flexibility and hill-climbing ability of the Ford car, and gives superior results and costs less than half that of the high tension magneto.

It consists of the Unisparker or distributor elevated to a convenient and accessible position which takes the place of the Ford timer and a single non-vibrating coil is installed in place of the four vibrating coils.

It is easily installed by anyone who can time a motor—no holes to bore—a screw driver and wrench are the only tools required.

Price, complete with hand-operated switch, \$28.00. Foot-operated switch \$2.00 extra.

For sale by all good jobbers and dealers. Write at once for circular "A"

Atwater Kent Mfg. Works, 4934 Stenton Ave., Philadelphia, Pa.

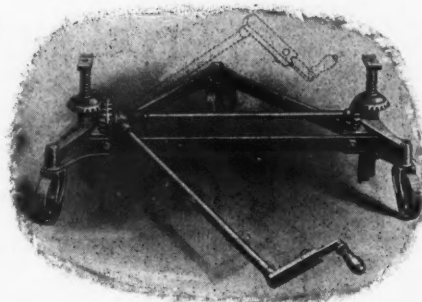


YOU need them Mr. Car Owner!



No Private Garage is
Complete Without

WEAVER AUTO TWIN-JACKS



The labor of caring for your car will be reduced 50% with an equipment of these wonderful Jacks. You can't fully appreciate their advantages until you have seen them in service.

Think of the convenience of having your garage equipped with A TURNABLE for turning your car around within the garage so as to prevent having to back out—

—also a ball and roller bearing transporting truck for moving your car about at will within your garage for washing, overhauling, etc.—

—and a set of tire rests which will take the weight off your tires in only two operations from a convenient standing position—

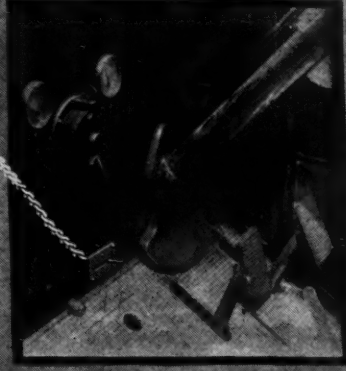
—and last, but not least, a full set of Lifting Jacks which will not turn over or let the car fall; and which are capable of supporting the rear axle with entire safety while you start your engine and test your brakes in a minute's time.

Think what you would have to pay for all this equipment if you bought them separately—then think of being able to secure all these advantages for only \$20.00. The saving in tires alone will pay for them within six months.

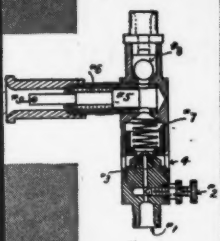
Two for \$20

At your dealers, or direct from

WEAVER MANUFACTURING CO., SPRINGFIELD, ILLS.



No Priming Needed—the **EXTRA-JET** Makes Starting Easier



No wise motorist today overlooks any device which will increase the efficiency of the car he drives; and of course every motorist is willing to install a device that will decrease his cost of up-keep.

THE EXTRA JET INCREASES EFFICIENCY AND SAVES MONEY

It is practically an extra jet for your carburetor, which supplies a rich mixture for starting and enables you to set the carburetor for correct running mixture; it will start your motor on the third or fourth pull even in zero weather. With electric starters it saves batteries and wear on the starter, in addition to fuel economy and elimination of priming. The Extra Jet is very simple in construction, and is easily attached; no soldering or machining required. Nothing but a small lever is seen on the dash. Try it for ten days. So necessary a part of your car will it become that you'll never part with it.

Price \$5.00, Complete

Your money back if not satisfied. Write for circular—NOW

Dealers: Here's something new that sells easily and leaves a handsome profit. Get a sample today

WELD MFG CO
NORTH CHATHAM MASS.

The Best One-Ton Truck on the Market for \$500 Down

A business proposition that appeals to any man who desires an up-to-date delivery service.



THE SELDEN TRUCK

embodies only the best ideas and most practical features of truck construction. Sturdy and reliable. Easy to handle. Economical to operate. It furnishes a delivery service you can depend upon in all kinds of weather over all sorts of roads.

THE SELDEN SALES PLAN

enables any business house to put the Selden \$2000 Truck in service upon the payment of \$500. Then the Truck earns the monthly payments.

Many users are buying additional Selden Trucks to take care of the business created by the increased scope of their delivery service.

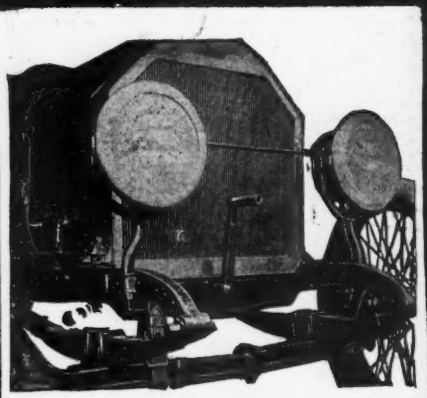
Agents with the right kind of sales and service facilities wanted

Selden Truck Sales Company

267 East Avenue

Pioneers in Selling Trucks on Time

Rochester, N. Y.



Henderson

The Ames Shock Absorber

*is in reality the
completed spring*

An inverted three-leaf steel spring—
spaced by the Ames steel block—
applied to your own spring—elim-
inating jar vibration—and danger of breakage.

MADE IN ALL LENGTHS AND WIDTHS TO CORRECTLY EQUIP
ALL SPRINGS. *THE SOLUTION OF THE SHOCK PROBLEM*

Catalog

Clarence N. Peacock & Company

EXCLUSIVE LICENSEES

1788 Broadway, New York, N. Y.

1510 Michigan Ave., Chicago, Ill.

Contracts Now Being Made for 1914 Agencies

Model 36-42
5- Passenger
Touring—
Fully Equipped
With Electric
Self-Starter



Dodge

\$1840

The Car That Looks and Acts the Thoroughbred It Is!

The man about to buy a car or the dealer contracting for deliveries is doing himself an injustice if he does not fully investigate the *Glide* 36-42 before deciding on any make car, regardless of price.

The *Glide* is a big, roomy, powerful five-passenger car that possesses features of construction and equipment rarely found on a machine selling for \$3,000 and upwards.

If you've got a wrong impression of the *Glide* because it sells for only \$1840, read a brief outline of the car given here and you'll see that the *Glide* is not a "cheap" car, but, in the strictest sense of the word, that it is a car of quality.

Automatic Dynamo Lighting System	Demountable Rims
Unit Power Plant	(Baker Bolted-on)
Long Stroke Motor with	118-inch Wheel Base
enclosed valves	Motor-Driven Tire Pump
Left Side Drive	Center Control
Electric Side Lamps in Dash	Electric Headlights and
Floating Rear Axle with	Tail Lamp
Pressed Steel Housing	Goodyear No-Rim-Cut
Westinghouse Electric Self-Starter	Tires

Thousands of these cars are running season after season with entire satisfaction to the owners and with no responsibility to the dealer.

Dealers are rapidly applying for agency contracts to sell the *Glide* through 1914 season, but there is still much desirable territory, which we will assign to those who are prepared to represent us intelligently and aggressively. Write for catalog, agency proposition and full information.

The Bartholomew Company

215 Glide Street, Peoria, Illinois

GABRIEL

Rebound Snubbers

are Standard Factory Equipment
on the Easiest Riding Cars

Peerless *White*
Oldsmobile
Stearns *Lozier*

They are also partial equipment on several other leaders and Special equipment on other prominent makes.

More 1914 cars will carry Gabriel Rebound Snubbers than any competing device. Snubbers now lead all others in number of cars equipped, just as they have always led in reducing upkeep expense and increasing riding comfort.



Easy for anyone to put on. No drilling or marring the car. Nothing to work loose, wear out, get noisy or need re-adjustment. Snubbers do not stiffen the springs; they merely control them, preventing abrupt or extreme action. They retard only the up-stroke, reduce the recoil and minimize all road shocks.

LIVE AGENTS WANTED

GABRIEL HORN MFG. CO., 1415 E. 40 St., Cleveland, O.

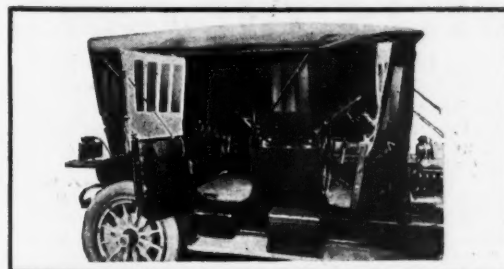
Makers of the famous GABRIEL Musical Horns and Auto Accessories

"SIMPLICITY CURTAIN OPENERS"

PATENTED FEB. 21, 1911



AS USED ON OLD TYPE CURTAINS



IMPROVES NEW TYPE CURTAINS

THINK

**What an Improvement
This Would Be to Your Car This Winter**

A simple time tried device that gives the protection of a limousine to your open car, without the annoyance of opening or closing the curtains or being locked in by them

A bracket that hand clamps on the doors of your car carries the curtains open or closed as you enter or step out

A Result Obtained By No Other Curtain Improvement

Strong, durable (some in use now three years) easily and quickly attached or detached, carried on curtain fasteners so that they do not mar the door or mahogany strip. Curtain openers are being used on the new "38" model of one of the best known cars in this country. They encourage the buying of open cars in the winter. You should have them on your car

ORDER THEM NOW --- They Will Fit Your Car

If your top maker has none in stock order direct. We will ship to any address in this country prepaid on receipt of price

Nickel Set \$5.00 per Door.

Black Enamel Set \$4.50 per Door.

Top makers can purchase these outright. No royalty payments necessary.

THE DAYTON TOP IMPROVEMENT CO.
DAYTON, OHIO.

THE
McKIBBIN
COON
SKIN



Satisfaction
Guaranteed

McKIBBIN Coon Skin Coats

¶ The ideal cold weather garment for the motorist is a Fur Coat.

¶ Raccoon Skin of the highest grade and in its natural color is the present day ideal Fur for Men.

¶ McKibbin Coon Skin Coats are made from prime selected northern skins, ample in cut and unequalled in appearance or in their comfort giving qualities. Literally the best coon skin coat that money will buy, for **\$160**

¶ If you motor through the winter without one of these coats you are subjecting yourself to an unnecessary hardship. Ask your dealer or send direct to the manufacturers.

McKibbin Driscoll & Dorsey
Saint Paul



More Buyers Every Day Insist on

BUDA MOTOR

"THE PART THAT SELLS THE CAR"

Modern complexity has brought into being the *Specialist*. Each "thing" we make is really a combination of many things, each of which may be a life work.

An Author writes a "book"—really a bundle of manuscript. He's a *Specialist* in ideas—like an *automobile designer*.

He turns the "book" over to a "Publisher" (who is a *Specialist* in the business end of book making.)

Can a Publisher "publish" a book by himself? Not without the aid of the Binder, a *specialist*. And neither can the printer print nor the binder bind without the Ink *Specialist*, the Paper *Specialist*, the Glue *Specialist* and all the others, *each doing ONE THING WELL*.

Can a car manufacturer manufacture a car? **NO.** Never could, cannot now, never will. And the tendency of the public is to realize this more and more, and (for the sake of **ECONOMY** and **QUALITY**) to insist on the BUDA MOTOR, made by a Successful *Specialist*. Always look under the hood. It's a good habit.

THE BUDA COMPANY

FACTORY, HARVEY, ILL., (Chicago Suburb)

Address all correspondence to our **FACTORY REPRESENTATIVES**

BRANDENBURG & COMPANY

1108 S. MICHIGAN AVE., CHICAGO

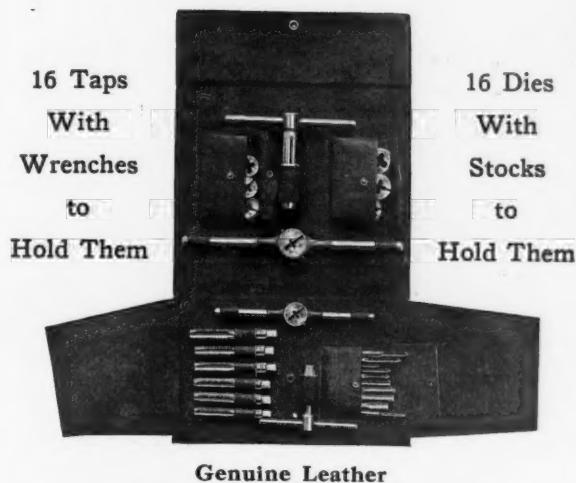
57TH & BROADWAY, NEW YORK

FORD BUILDING, DETROIT

When Writing to Advertisers, Please Mention Motor Age.

"Lightning" Repairs

Require a
"Lightning" Auto
Repair Kit



Genuine Leather

You are not fitted to run a FORD CAR till you have a "Lightning" Auto Repair Kit under the seat.

Cures sick, mutilated, stripped threads, and makes new threads where none were before.

Ask Your Dealer

If perchance he should not be "wise" write the manufacturers.

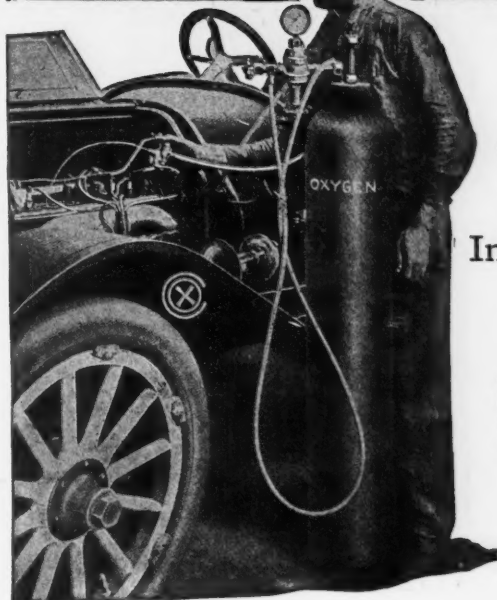
WILEY & RUSSELL MFG. CO.
Greenfield, Mass.

NEW YORK
90 Center St.

PHILADELPHIA
38 N. Sixth St.

CHICAGO
545 W. Washington Blvd.

COX OXYGEN CARBON CLEANER



New
Thorough
Quick
Inexpensive
Harmless
Efficient
Necessary
Profitable

The first really efficient and thorough method of cleaning carbon out of the cylinders is the new Cox Oxygen Carbon Cleaner. It consumes every particle of carbon, even in corners where it could never be scraped out, without the slightest possibility of harming the cylinders.

It takes from 6 to 10 minutes to clean each cylinder, averaging 30 minutes for a four cylinder motor and 45 minutes for a six. Any workman can do it. Does not require experience or expertness. Absolutely safe to handle.

For Public Garages

The profit possibilities for you in the Cox Oxygen Carbon Cleaner are only limited by the number of your customers. You do the work in one-tenth the time and only a fraction of the cost of any other method. Motorists will pay you well to clean their cars regularly. It is just as necessary as washing the car. This new method will quickly establish the custom of regularly cleaning.

For Large Private Garages

For private garages in which more than one or two cars are kept, the Cox Oxygen Cleaner is a good investment. It pays for itself in the greater economy and improved running of the car.

Write Us Today

and we will prove that your profit per cylinder is almost gross—that you can actually pay for the carbon remover several times over inside of a week—this has been done.

Get the information—read the detailed facts—learn still more about the integrity and responsibility back of the house that guarantees every claim made for this—the only real carbon cleaner.

COX BRASS MFG. CO.
ALBANY, N.Y.

1779 Broadway
New York City
870 Woodward Ave
Detroit, Mich

Gentlemen Please send me full information about the Cox Oxygen Carbon Cleaner.
Name.....
Address.....
City.....
State.....
M. A. 10-30



When you are in New York

—either for a brief visit or a prolonged stay—the important question of where to live is best answered in the Hotel McAlpin.

It is the world's largest and safest hotel—renowned for its

Luxurious, home-like comfort
Wonderfully efficient service
Exceptionally central location
Notable moderation in prices

Distinctive surroundings—perfect appointments—unexcelled cuisine—the character of accommodations you have always sought at the prices you have always wanted to pay.

Situated at Broadway and 34th Street—the axis of the city's transportation systems—on the threshold of the shopping and amusement districts. Conveniently accessible to Pennsylvania and Grand Central Stations.

Management of MERRY & BOOMER

HOTEL McALPIN

Herald Square

NEW YORK

Nearer than Anything to Everything



**Packard—Peerless—Winton—
 Stevens—Duryea—Lozier—
 Stearns—Palmer—Singer—
 Franklin—Havers—Chalmers—**

and the makers of many other high grade cars use and highly endorse

Four Cylinder KELLOGG Tire Pump

Because the makers of these cars have used the Kellogg for four years and found it to give consistent and satisfactory service;

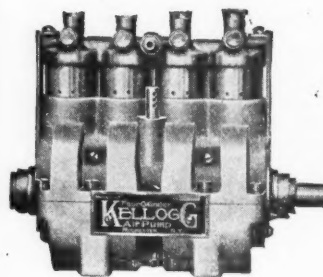
Because they have found the Kellogg the only power air pump good enough to become a part of their equipment;

Because the Kellogg's four cylinders do not strain the motor or gears;

Because the Kellogg is quick in action, reliable at all times, and never permits oil to enter tires;

Because the Kellogg is the best power air pump ever placed on the market.

Manufacturers— Dealers—Car Owners



Attachments are supplied for installing the Kellogg in practically any model of any car now in use or announced for 1914.

Write for our book—"Air On Tap." Learn what the Kellogg will do for you—how it will make money for you.

Kellogg Manufacturing Co.

Circle & Main Sts., Rochester, N. Y.

NEW YORK 1744 Broadway SAN FRANCISCO 444 Market St. CHICAGO 1112 S. Michigan Ave.



IN the progress of man to the advanced methods of today, all has depended on improvement in quality and efficiency of manual tools. Best representative of modern tool standards are unquestionably

Billings & Spencer Tools

"The tools that are guaranteed"

The reason is in the fact that their advanced features of construction provide the utmost in efficiency, convenience, ease of action and durability.

Write for catalog and prices

Billings & Spencer Company
Hartford, Conn.



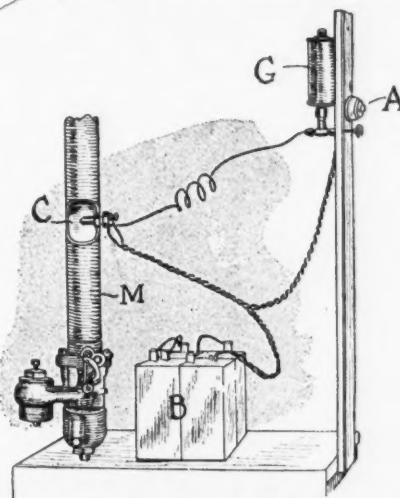
Now You Can START YOUR CAR as easy in winter as you can in summer

You can if you equip your car with a Volcano ELECTRIC Primer.

It is the only primer on the market that works on the electric principle—the surest and quickest principle. You simply press a dash button (A) and heat is generated by battery current (from batteries "B") passing through a little cup-like device (C) containing about a thimbleful of fuel.

This electric current causes the gasoline to evaporate immediately. The vaporized gasoline—sufficient to spin the motor 200 times—is drawn from manifold (M) into your cylinders. One-half turn of the crank serves to start the coldest, stubbornest motor if your car is equipped with a

Volcano ELECTRIC Primer



Showing Primer Attached

Spins Motor 200 Times On One Priming

The gasoline retainer (G) behind the dash contains sufficient gasoline for 150 primings.

Anyone can attach a Volcano Primer in 30 minutes. The Volcano Primer is admirably adapted to cars equipped with self-starters. It relieves the little starter motor of 50% of the strain on it, increasing its life and efficiency proportionately.

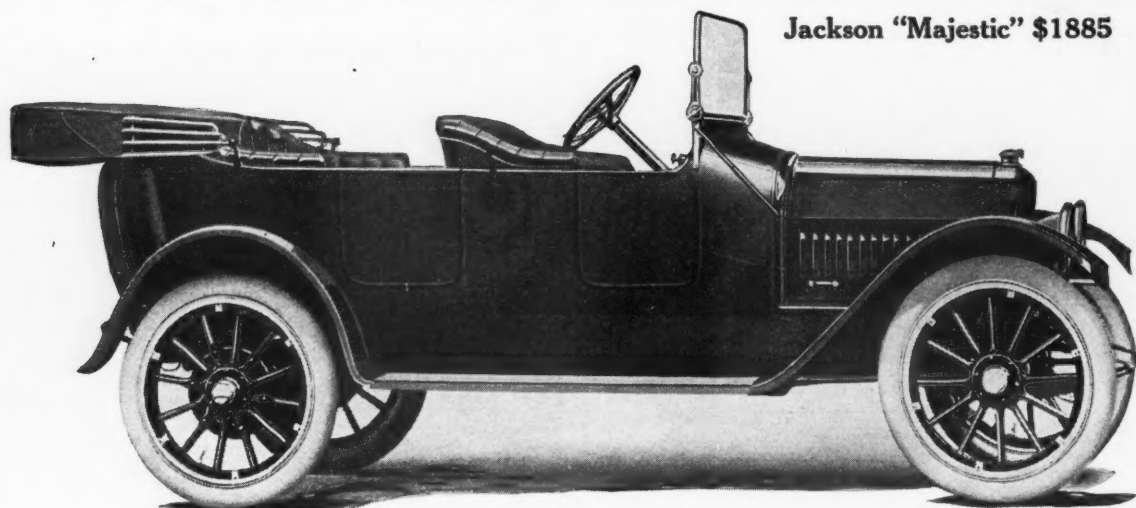
Now is the time, before cold weather sets in, to install your Volcano Primer. Once attached, your hard starting problems are solved for the life of your car. Satisfaction Guaranteed.

Price \$10.00

SENT PREPAID ON RECEIPT OF PRICE

DEALERS: Write for agents' proposition in unallotted territory. Get in touch with us today

Volcano Electric Primer Works, Virginia, Ill.



Jackson "Majestic" \$1885

Jackson

**"No Hill
Too Steep,
No Sand
Too Deep"**

**Three models that defy competi-
tion for 1914, and place Jackson
dealers in a position of security
where their profits are sure.**

Increased production for 1914 gives opportunity for a few more dealers to take on the Jackson line. We cannot allot contracts to a great many but here and there throughout the country there are territories which we would like to open up with the right kind of representation and the man who gets a Jackson contract for 1914 picks off one of the plums of the year.

Jackson prices meet all competition even on the basis of *specifications*. And the same honest old-fashioned stability and power and general mechanical superiority that always have been in the Jackson are *still* in the Jackson and always will be. The equipment is everything that any owner could ask for. In style the cars are as beautiful as any designer ever dreamed of.

"Olympic Forty" \$1385

Long stroke, 40 h. p. ($4\frac{1}{2} \times 4\frac{1}{2}$ inches) electric cranking. Rear Axle—Semi-floating, roller bearing throughout, with ball thrust bearings. Full elliptic springs, front and rear. Gasoline tank under cowl, gravity feed to carburetor and short intake pipe. Wheel base 115 inches. Tires, 34 x 4. Equipment—Mohair top, top hood, ventilating windshield, speedometer, gasoline gauge on dash. Firestone demountable rims, extra rim, tire holder, foot-rail, coat-rail, pump, tools and jack. Electric cranking, electric lights and electric horn.

"Majestic" \$1885

Long stroke, four cylinder motor, $4\frac{1}{2} \times 5\frac{1}{4}$, 45 horse power, electric cranking. Wheel base 124 inches. Tires, 36 x 4. Full elliptic spring suspension front and rear. Full floating rear axle. Extra roomy body. Wide seats, wide doors, 10-inch cushions. Completely equipped.

"Sultanic" \$2150

Long stroke, six cylinder motor, 55 horse power, electric cranking. Wheel base, seven passenger, 138 inches; five passenger, 132 inches. Tires, 36 x $4\frac{1}{2}$. Full elliptic spring suspension front and rear. Full floating rear axle, ball bearing throughout. Completely equipped. Seven passenger model, \$2300.

WRITE OR WIRE FOR ALL DETAILS

JACKSON AUTOMOBILE COMPANY, 1207 E. Main St., JACKSON, MICHIGAN



Shift this lever—forget the weather

Don't put up with hard winter starting this year as you did last. Now is the time to equip your car with a carburetor which you can always keep set at its most economical adjustment—a carburetor that will enable you to start as easily in winter as in summer. Get a

Motsinger
Carburetor increased mileage guaranteed

For cold weather starting you simply shift a lever on your steering post towards "Rich." The carburetor feeds a rich priming or starting mixture to the motor till it "warms up." You then shift the steering post lever back towards "Lean," till your motor is running on its most economical and powerful mixture.

This MOTSINGER steering post lever takes care of all changes in temperature, altitude, and humidity.

Write for full particulars.

The Motsinger is guaranteed to increase your mileage or your money refunded.

Try one on your car or truck.

The lever "weighs out" a just right mixture down here



At zero a different adjustment is required to run a car than at 20° above zero. Every change in temperature noticeably affects conditions of carburetion. Changes in temperature occur many times a day. To keep pace with these temperature changes you would have to be down under the hood changing an ordinary carburetor constantly to get maximum efficiency from your motor at all times.

If you don't keep pace with temperature conditions your carburetor is constantly off balance—is feeding either a too rich mixture or a too lean one. In the former case you are wasting fuel; in the latter, losing power.

With the MOTSINGER Steering Post Control you can "weigh out" a just-right mixture suited to any given temperature. You can balance your mixture instantly without ever tinkering with your carburetor adjustments. Once this balanced mixture is found for your given temperature, the MOTSINGER automatically and uniformly delivers this mixture throughout the motor's entire range.

This is possible only because of the mechanical perfection of the MOTSINGER air and needle valve construction, the most logical construction, engineers claim, yet discovered.

**Motsinger
Device Mfg. Company**

869 Putnam Street Lafayette, Ind.
Chicago distributors, O. Junkers, 1806 Mich. Ave.

The SPARK PLUG For WINTER



THE ALL-IN-ONE SPARK PLUG

In winter, this plug is as good as a self-starter, and costs less. Inject a few drops of gasoline into your cylinders through this plug's priming cup, and you can easily start your motor with one turn of the crank—regardless of how cold the weather may be.

All-In-One Spark Plugs also clean themselves, help decarbonize your motor, and find that missing cylinder. They cost no more than ordinary plugs, which will do none of these things.

Price \$1.25 Each

FRONTIER SPECIALTY CO. 530-545 Ellicott St. BUFFALO, N. Y.

Schrader Universal Valves

Established 1844
Trade Mark Registered April 30, 1905

Simple and Absolutely Air Tight



Schrader Motor Valves, as shown in cut, are the regular equipment on all styles of pneumatic tires for automobiles. Our No. 777 Tire Valve is the standard for 2½-inch and 3-inch Automobile Tires, and our No. 725 Tire Valve is the standard for tires larger than 3-inch.

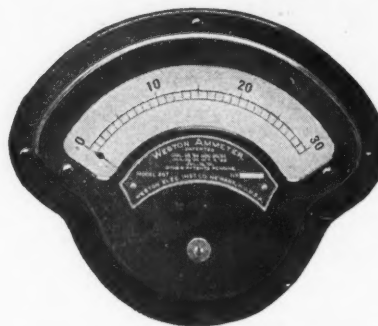
These are made in different lengths, to fit different styles of tires and rims.

SUPPLIED TO THE TRADE BY
ALL TIRE MANUFACTURERS

MANUFACTURED BY

A. Schrader's Son, Inc.
28-30-32 Rose St., New York

A reliable Electrical Measuring Instrument indicates quality.



Weston Model 267 Dashboard Ammeter

WESTON AMMETERS

for control of Electric Lighting and Self-Starting Systems are the most reliable, durable and highest grade instruments made for this purpose.

Please send for our 30-page
bulletin No. 8 describing them

Weston Electrical Instrument Co.
NEWARK, N. J.

New York
Philadelphia
Chicago

Boston
San Francisco
St. Louis

Denver
Cleveland
Detroit

Birmingham
Toronto
London

Montreal
Paris
Berlin



MAYO SPARK PLUG PUMP

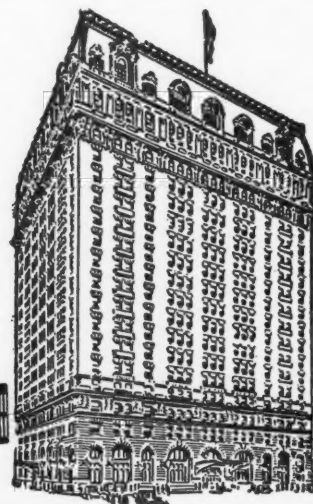
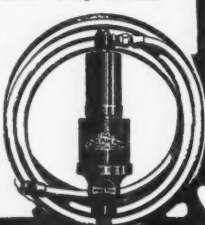
A simple and powerful pump adaptable for use on all cars from the smallest Ford to the largest Lozier. Instantly attached by substituting it for a spark plug. Pumps nothing but pure, fresh air. Inflates the tire in from 2 to 4 minutes. Built with metal rings like your engine and will last as long. Requires no attention other than an occasional drop of oil.

Weights only 2½ pounds.
Furnished with adapters
to fit any car, 12 feet
of hose and connections.
Price \$10.00. With
Pressure Gauge, \$2.00
extra.

You can try it on your
own motor before
purchasing

The Mayo Mfg. Co.
55 E. 18th St., Chicago

\$10⁰⁰



Hotel La Salle

CHICAGO'S FINEST HOTEL

ERNEST J. STEVENS, Vice-Pres. and Mgr.

Located in the heart of the city, within easy reach of all railway terminals

RATES

ONE PERSON	Room with detached bath.....	\$2 to \$3 per day
	Room with private bath.....	\$3 to \$5 per day
TWO PERSONS	Room with detached bath.....	\$3 to \$5 per day
	Room with private bath.....	\$5 to \$8 per day

TWO CONNECTING ROOMS WITH BATH

Two persons	\$5 to \$8 per day
Four persons	\$8 to \$15 per day
SUITES	\$10 to \$35 per day

LA SALLE AT MADISON STREET, CHICAGO

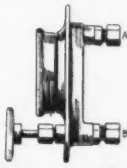
The Webb Jay Automatic Primer

Insures easy starting.
Eliminates useless cranking.
Simple, automatic and everlasting—
Needs no attention.
Indispensable in cold weather.

Front View



Side View



Price \$6.00 each

Sent Prepaid on Receipt of Price

If not satisfactory, after 30 days' use, your money refunded

SOME TERRITORY STILL OPEN TO AGENTS

Webb Jay Motor Devices Company
2635 Wabash Ave., CHICAGO

A Special Spark Plug for Your Car

"Any old Plug" will not, cannot, give you satisfactory service. There is a particular model that is best suited to each car. And there is a particular make that is best suited to all cars. It is the

HERZ PLUG



FORD TYPE

"Bougie Mercedes"

We make special models for the Ford, the Pierce-Arrow, the White, the Pullman, the Amplex; extra long shanks for the Buick, the Overland, the Maxwell, the Pope-Hartford; and three standard models— $\frac{1}{2}$ -inch, $\frac{3}{4}$ x 18 (A. L. A. M.) and metric—which meet the requirements of all other motors.

HERZ PLUG has Double, Unbreakable Stone Insulation (Blue Enameled) and Four Sparking Points of Platinum-alloy. It is Self-cleaning and

Guaranteed a Full Year

HERZ & CO.
295 Lafayette St. New York
Makers of the HERZ MAGNETO

"The ACME of PRECISION" is The WARNER TRANSMISSION

"Warner Gears—Standard for Years"

Communication with either our Detroit office, 628 Ford Building, or our factory, direct, will solve that gear problem which now confronts your Engineering Department.

"Warner Gears"—An essential selling argument.

WARNER GEAR CO
MUNCIE - IND -

MOTOPHONE

A Mechanically Operated Horn



\$12

NO Adjustments
Motor Troubles

NO Electrical Wiring
Battery Expense

A loud steady blast is emitted by a slight touch of the lever. As compelling as any motor-driven horn—eliminating the constant care of the electric motor, the recharging of storage batteries, adjustments and cost of maintenance.

Manufactured and guaranteed by

Automobile Supply Mfg. Co.
220 Taaffe Place Brooklyn, N. Y.

RECEIVER'S SALE

Entire Automobile Plant of

R.C.H. Corporation

Detroit, Michigan

The property of the R-C-H Corporation will be offered at Public Auction on the premises, Detroit, Mich., under order of the United States District Court, on

Tuesday, November 11th, at 10 A. M.

The property will be offered in both parcels and bulk. Conditions of sale may be obtained of the Receiver. The property comprises the following, subject to revision as of day of sale:

Real Estate (16.57 acres and factory buildings)	\$201,000.00
Plant Equipment and Machinery	213,889.75
Materials, Supplies and Branch Stocks	313,968.28
Cars	14,530.00
Accounts Receivable	60,634.58
Notes Receivable	3,175.00
	\$807,197.61

The plant is equipped for the manufacture of a \$900.00, five-passenger touring car; is located in the heart of the industry, with railroad siding, and is ready to resume business, with orders for a large number of cars. The R-C-H car is widely advertised, at an expense of \$324,000. The different parcels of the plant are also admirably situated for use as separate units. There are an office building, a foundry, machine-shop, drop-forge plant, and assembly building. The parts business is important, nearly 9,000 cars being in use. The stock of materials is large and well assorted.

For particulars address:

SECURITY TRUST COMPANY

Detroit, Michigan

Receiver

Starts — Lights — Ignites

REMY

Six Volt System—Does-It-All

THERE is only one real way to provide for the efficient starting, lighting and ignition of your car.

Have one manufacturer design and build all three systems; have this one manufacturer responsible for all three.

We are the only concern building the complete apparatus—either as a whole or in any combination—starter—lighting equipment—magneto, or battery ignition (generator and storage battery). The starting and lighting equipment is sold only to automobile manufacturers.

Write for our magneto exchange offer.

Remy Electric Company

General Offices and Works, Anderson, Indiana

BRANCHES:

New York Detroit Kansas City Minneapolis
Boston Chicago San Francisco

(Service stations throughout the country)

Veeder

Exactitude

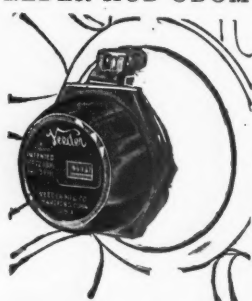
in the mileage of an automobile or motor truck is a primal necessity if you insist upon knowing the upkeep cost of tires, gasoline or "juice" and lubricating consumption. A VEEDER HUB ODOMETER is not only exact but CAN'T BE TAMPERED WITH.

Neat, durable and compact, it can be easily attached. Price complete, **\$25.00**

At your dealer's, direct from our factory, or at the following agencies:

T. H. Cranston & Co., 56 E. Randolph Street, Chicago, Ill.

Bernard I. Bill, 543 Golden Gate Avenue, San Francisco, Cal.



The Veeder Manufacturing Company

C. H. VEEDER, President D. J. POST, Treasurer
H. W. LESTER, Secretary
HARTFORD, CONN.

Makers of Cyclometers, Odometers, Tachometers, Tachometers, Counters and Small Die Castings

Make Good Your Spark Plug Guarantee

Manufacturers who sell spark plugs under a guarantee against porcelain breakage have found it dollars and cents in their pockets to specify "EMPIRE."

EMPIRE Porcelains are made by a special toughening process to withstand the roughest usage. They are fired at a temperature of 2,600° Fahr.—a greater heat than any spark plug is called upon to stand in every-day service. The incessant pounding and jarring of vibrating cylinders has little effect upon them. Made of best imported kaolin by porcelain specialists.



Send for Sample

Empire

142-156 Greene Street

and Catalogue

China Works

BROOKLYN, N. Y.

The Metropol

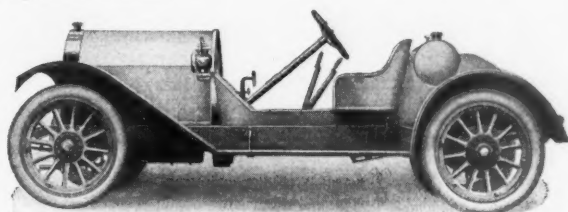
Inaugurating a New Era in Automobile Construction

The Real Long Stroke Motor (Perfected)

4 1/4 Inch Bore 7 7/8 Inch Stroke
25 Miles on a Gallon 75 Miles an Hour

A Construction heavy and strong enough to transmit big power, but very light and very simply designed.

A Motor of 4 1/4" bore, rated 30 H. P., but developing 90 H. P., on brake test. More flexible than the ordinary 6-cylinder motor.



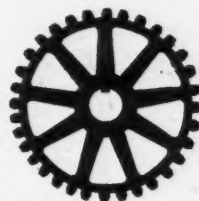
Model C Speedster, \$1350

A powerful speed car that can be purchased and operated at very low cost.

Some desirable territory open to agents and distributors.

Metropol Motors Corporation
1926 Broadway New York

GEAR STEEL



BY THE CROSS ROLLED (United) PROCESS

Free from seams and of Uniform Quality

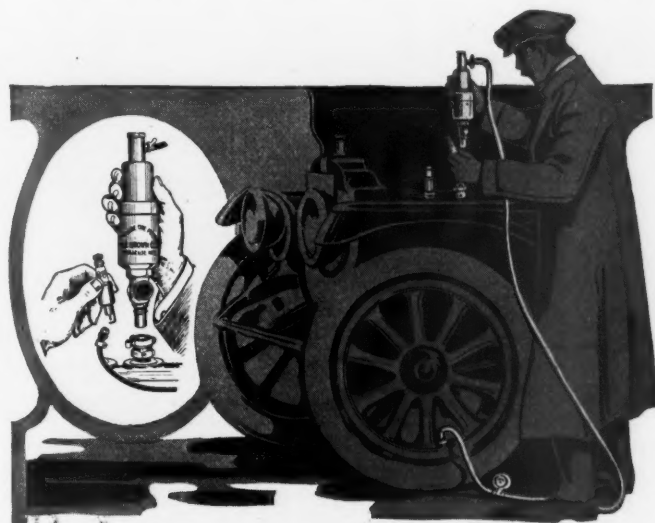
CROSS Rolled (United) Steel gives you assurance that the labor and expense you put into your manufacture is not going to be ruined by an inferior or even an ordinary steel.

No matter whether it is Chrome Vanadium, Nickel, Chrome or Special Analysis O. H. Steel, we can offer you the same superiority and exclusiveness.

Write today
for quotation
and data.



New York
Chicago
Detroit



The Brown Impulse Tire Pump with the B'Co Q. D. Spark Plug

Means tire inflation with all the hard work and backache left out. Your motor does the work.

Means proper inflation and greater mileage from your tires. Attached and detached with your two hands, no wrench, no broken spark plugs.

Pump complete, including Plug.....\$15.00
Extra Spark Plugs.....1.50
Previous Brown Pumps made over to fit these connections.....2.00

THE BROWN CO., 120 Bellevue Ave., Syracuse, N. Y.

BADGER GEAR COMPOUND



"Always on the Teeth"

STAYS where you want it. Clings to the gear teeth at all speeds. Won't pack on the sides of the gear case. Does not run thin. A perfect lubricant from every viewpoint. We also make the well-known F.V. Motor Oil and the Badger Lubricants. All these products have held their own, in actual service, under the most exacting conditions, and are covered by rigid guarantee.

**STOP
THAT NOISE**
Badger Gear Compound
Will Make Noisy Rear Axles
and Transmissions
KEEP QUIET

Users
Write for
name of
nearest dealer

Ask Your Dealer
or
WADHAMS
OIL CO.

Dealers
Write for
prices and ter-
ritory on biggest
seller you ever had.

U-S-L



U-S-L

Takes the place of the Fly-wheel

The U-S-L Electric Starter and Lighter is a combination motor and generator that takes the place of the fly-wheel. The armature of the motor-generator is bolted directly to the engine crank-shaft.

The U-S-L doesn't add a single extra moving part to a car.

No gears or chains
No added weight
No bearings to oil

No extra clutches
Starts at a push of foot-button
Supplies ample current

Adopted by

Rambler, Garford, Edwards-Knight,
Moyer, S. G. V.

Write for Bulletin 501

The U. S. Light & Heating Co.

General Offices: 30 Church St., New York

Branch Offices and Service Stations—New York, Boston,
Buffalo, Cleveland, Detroit, Chicago, St. Louis, San Francisco.

Automobiles Bought for Cash

—Any Quantity—

If you want to sell your Ford, Studebaker, Buick, Overland, Cadillac, Hudson, Packard, Peerless, Pierce, Maxwell, National, American, Regal, Locomobile, Flanders, or any standard make of car, not earlier than 1910 model, for Cash, write us full description and price F. O. B. Pittsburgh.

Give your Model, Make, Condition of Motor, Transmission, Differential, Tires, kind and condition of equipment together with The Very Lowest Spot Cash Price, and enclose stamp for reply.

If satisfactory we will mail you check for 20 per cent of the price, and balance after car is inspected at Pittsburgh.

Auto Trading Co., COLLINS AVENUE Pittsburgh, Pa.

References. East End Savings and Trust Co., Pittsburgh, Pa.
Bank of Pittsburgh N. A. or any Mercantile Agency.

We want experienced men to buy cars for us. Liberal commissions paid.

NORMA

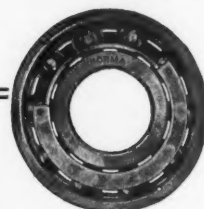
HIGH SPEED, HIGH DUTY

BALL BEARINGS

Prememinently adapted for every high-speed service where the utmost durability is essential

Write for Bulletin 103

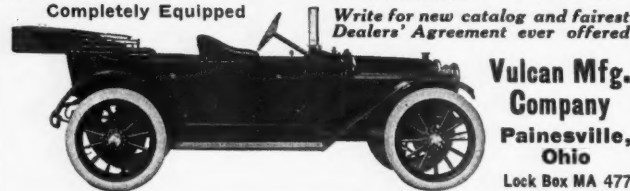
Norma Company of America
20-22-26 Vesey Street New York



The Vulcan 27

"The World's Greatest Light Car"

Speedster \$750 Touring Car \$850
2 Passenger 105 inch Wheelbase
5 Passenger 115 inch Wheelbase
Completely Equipped



Vulcan Mfg. Company
Painesville, Ohio
Lock Box MA 477

Six Cylinder, 65 H. P.
Equipped with Vulcan
Electric Gear Shift.

Four Cylinder, 40 H. P.
Equipped with Vulcan
Electric Gear Shift.

HAYNES

America's First Car

Our advertising campaign will send a buyer into your showroom more than half convinced that he should own a Haynes; the sale, however, results only from a successful demonstration; it is our firm belief that as a Haynes dealer you possess more than a sufficient number of convincing arguments to make every demonstration result in a quick and profitable sale.

May we tell you why we believe this?

THE HAYNES AUTOMOBILE CO., 2 Main St., Kokomo, Ind.

REPUBLIC 1500 - 2000 POUNDS CAPACITY \$1425

Where Can You Get as Much for so Little?

You can't dodge this conclusive fact—that in the REPUBLIC you get more value, dollar for dollar, than in any other truck on the market—and you get more in service, no matter what price you pay. In what other truck—at anywhere near the REPUBLIC price—will you find all of the following high-standard features? Continental Motor, Covert Transmission, Schebler Carburetor, Culver-Taylor Chains, Left Hand Drive, Gemmer Steering Gear, Lewis Springs, Elsemann Magnetos, Bower Roller Bearings, Center Control. You know all these parts. You've read about them. You know that these are produced by specialists. Again, we ask you, where can you find a dependable, economical truck, with all these high-grade parts, and, in addition, a stake, or express, body for \$1425?

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Dealers—Think for a moment of all the splendid, convincing talking points that there are in the above specifications. The entire truck is every bit as good as its individual parts. Prove it for yourself. Get in touch with us—NOW.

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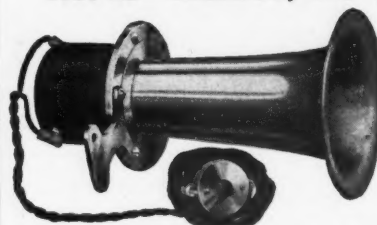
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General Sales Offices, 870 Woodward Ave., Detroit, Mich.

Motor Driven Horn

No. 23—Samson, Jr.

\$10.00



Loud Simple
Strong Reliable
Guaranteed

Big Factory and
Financial Responsibility
back of every
Samson Horn.

Live Dealers Get Our Money Making Offer

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Motor Cars

Pioneer Builders of American Sixes

STEVENS-DURYEA COMPANY

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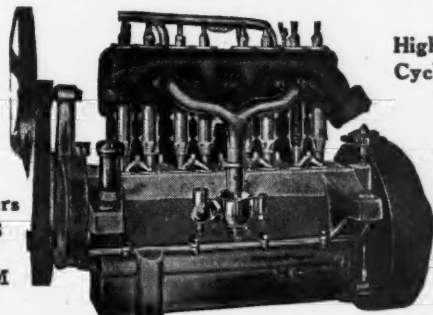
Brennan Standard High Grade Motors

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Bearings
Long
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4 and 6
Cylinder

Our leaders

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4½x5

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4x5



High Grade 4-
Cycle Motors

for

Elmore Cars:
Warren, Cor-
bin, White
Steam Cars
and standard
makes of cars
and trucks,
also trans-
mission gears.

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Never Fails To Hold

On steep hills—when collision threatens—or in any crisis, you can always depend on this brake lining. It never slips. Takes right hold of the drum the instant you apply the brakes. It CAN'T BURN! Practically indestructible. Outwears 12 ordinary linings. Made of pure Asbestos interwoven with strong brass wires.

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OPERATES FROM MAGNETO—NO BATTERIES NEEDED



Why "HI-LO" is horn perfection.
No vibrator contacts to adjust.
No pivots or bearings to wear.
No rubber bulb to rot.
No oiling required.
No sticking of reed.
No clogging of whistle.
No trouble to instantly operate.

JUST NO HORN TROUBLE
Anyone Can Attach It in 15 Minutes
GUARANTEED

to not interfere with ignition

All "live" Jobbers and Dealers are selling the "HI-LO" because it is the most "live" Ford accessory on the market.

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Complete Line of Commercial Vehicles

All type bodies—special bodies designed. Unexcelled for service, efficiency and economy. KisselKar Trucks have great reserve power. Low fuel cost; sizes to give most economical service under all conditions.

1500 lbs. 1, 1½, 2½, 3½, and 6 Tons

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"32" Touring car, fully equipped.....	\$1050
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"32" Touring car or Roadster with Westinghouse two-unit electric generator and starter; electric lights; over-size tires, 33x4 inches; demountable rims, extra tire carrier at rear	1200
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With same options as above.....	1300
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HUPP MOTOR CAR COMPANY

1228 Milwaukee Avenue

Detroit, Mich.

FEDERAL TIRES

give "Extra Service"

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The Oil Pot
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Ham's Steel Motor
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¶ HESS Axles have been on the market but 2 years. Fourteen car manufacturers in that short time exclusively adopted them as regular equipment.

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till you see our announcement,
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MOLINE AUTOMOBILE COMPANY
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Braender Tires & Tubes

Are of the highest quality
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They are built to last.
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1211 Bedford Avenue, Brooklyn, N. Y.



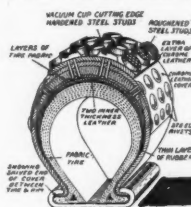
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At last the pneumatic tire problem has been virtually solved—the weak points in previous tire construction have been eliminated. The resiliency of a Bricton Pneumatic Tire puts it in a class by itself. It is Puncture-proof—Blowout-proof—Skid-proof—Rut-proof—Rim-cut-proof—Oil-proof and Gasoline-proof.

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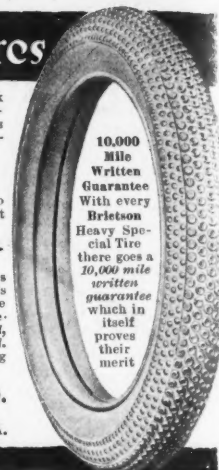
To remove all doubt that might arise in the purchaser's mind and to back up our statements—we will allow 10 days' free trial on the first set that goes into each town.

Your Tires Can Be Made Like This →



If you are not in need of new tires and the fabric in your present tires is still good—we can rebuild them the Bricton Way—making them Puncture-Proof, Non-Skidding, Blowout-Proof, Rut-Proof, Oil-Proof and Rim-Cut-Proof. Write today for full particulars, giving your dealer's name.

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LOZIER

"The Choice of
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"SIX"

\$3250

A big, roomy, completely equipped "Six" which will satisfy the man who wants the highest class, most distinguished looking motor car obtainable.

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\$2100. Deliveries Jan. 1, 1914. A true Lozier in every detail, 7 passengers, Gray and Davis Electric Starting and Lighting. Completely equipped. Meets the want of the thousands of motorists who have always longed to own a Lozier, but who have been prevented by the cost.

Lozier Motor Company, Detroit

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When you buy SCHAFER BALL BEARINGS you are not experimenting because SCHAFER BALL BEARINGS have for years been recognized as the standard of bearing quality. They are made in Germany of the best steel and are now in universal use throughout the world.

BARTHEL & DALY

42 BROADWAY

NEW YORK

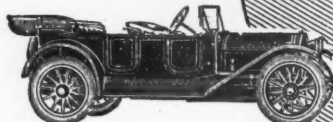
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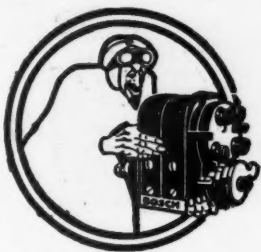


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KEATON NON-SKID TREAD

has four times the wearing service of the ordinary non-skid. Users will tell you that they have run Swinehart Keaton Non-Skid Tread Tires a whole season without having them lose their anti-skid effectiveness. Call at any one of our stores and investigate them. We also make a complete line of Smooth Pneumatic Tires of best quality. Branches and distributing agencies in all leading cities.

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THE Bosch-Ford Attachment makes it possible to easily install the Bosch Magneto on the Ford car—it gives greater efficiency in every respect and the same reliable ignition supplied with Pack-

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"Look for Elyria-Dean where Quality's seen."

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For seven years Mr. Winton has devoted himself to the perfection of a single model exclusively. He has had just one aim—to keep the Winton Six ahead of all other cars in beauty, comfort, mechanical excellence, and value. No wonder the 1914 Winton Six is the fashion plate of American motor cars.

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Fearless!
Not even a clutch!
The simplest car made—
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Twice the usual tire mileage.
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Made by Bridgeport Brass Co.

Increases the Life of Tires

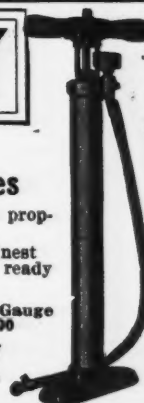
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It is an efficient Compound pump of the finest materials and workmanship; it is always ready and always works.

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Repair any casing or tube anywhere. Electric vulcanizers for use on lighting current—steam vulcanizers if electricity is not available. The only vulcanizers that anyone can use safely because of the exclusive feature, an automatic temperature control that insures perfect repairs.

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Flush Type—Price . . . \$9.00

Delivered upon receipt of price
Send for Bulletin No. 28

Connecticut Electric Company, Inc., Meriden, Conn.

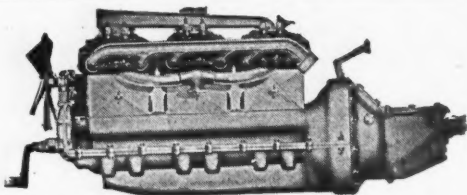
RUDGE-WHITWORTH DETACHABLE WIRE WHEELS

*Fitted With HOUK Quick
Detachable Rims*

Make for greater resiliency, smoother riding. Save tires. Are quickly and easily removed. Practically indestructible. Absolutely rust-proof. Now being manufactured in America by the Standard Roller Bearing Company, of Philadelphia.

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Beaver "Sixes" offer the following 1914 features: long stroke (3" x 5"); just right power, 45 H. P.; 3-point suspension; large valves with enclosed action; enclosed fly wheel; 3-speed transmission; noiseless, vibrationless, oil and dust tight action; arrangement for installation of any make Electric Starting and Lighting System. Write for catalog and prices.

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Builders of 2, 4 and 6 Cylinder Motors

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Prest-O-Lite is the most RELIABLE Lighting System

All the facts on
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Mailed you on request

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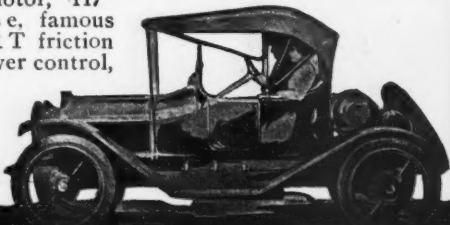
(Contributor to the Lincoln Highway)

The LAMBERT

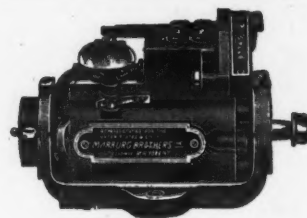
The LAMBERT Model 99 (5-passenger touring car or 2-passenger roadster) at \$1365 (fully equipped) stands at the head of its price class. It comprises 4 1/8 x 5 1/4

Rutenber motor, 117" wheelbase, famous LAMBERT friction drive, one lever control, etc. Write for catalog.

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PATENTED IN U.S.A. AND ALL FOREIGN COUNTRIES

STOCK SHEETS 6" WIDE BY 36" LONG

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For Adjustments of Bearings. No More Filing.

A perfect reduction is obtained at once simply by loosening one corner of a layer with a knife or other sharp instrument and peeling it off. The rest of the shim remains as solid as ever.

Stock Sheets and Box Assortments of Strips—On sale by all leading Jobbers and Dealers.

Special stamped shapes supplied to manufacturers when desired.

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How Largest Profits Are Made

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We have some interesting facts in connection with increasing your car sales and profits.

Selling some cars, you may sell large numbers—and still your yearly business shows a loss.

Through merchandizing strategy we have remedied these flaws. May we tell you about these things and about our kerosene-burning car, equipped with wire wheels, cowl dash, cowl gasoline tank. Left drive, center seat control—the most salable car offered today.

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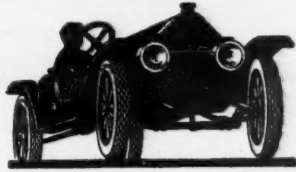
Indianapolis, Indiana

HENDERSON

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HYATT ROLLER BEARING CO. • WORKS, DETROIT, MICH.

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If he has Republics on his car

you can rest assured he's a good "buyer." He knows that first cost is the last item to consider in tire buying, that quality counts most—quality in material, in design, in workmanship.

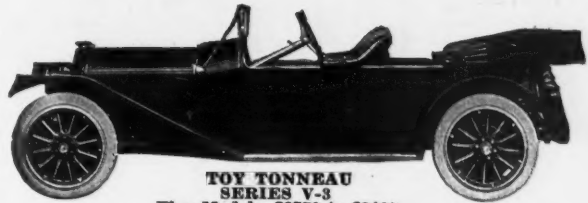
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REPUBLIC STAGGARD TIRES TREAD

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We Specialize in High-grade Automobile Parts

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\$5000 in Cash Prizes

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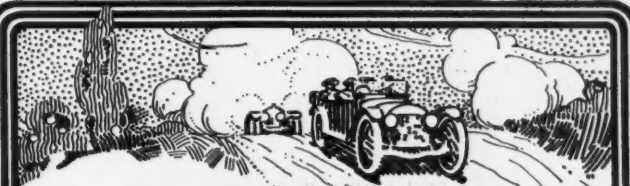


A New Six—For a New Market

Every feature is standard and the highest of its class, both in quality and reputation.

Five-passenger touring car completely equipped—\$2485. Dealers write for open territory

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Branch, 2002 Broadway, New York City



RAYFIELD CARBURETOR

More power - Less fuel - Wider range

FINDEISEN & KROPF MFG. CO.
21ST & ROCKWELL STS., CHICAGO, ILL.

KEETON

DETROIT U.S.A.

"SIX-48"
\$3250
Fully
Equipped

Riverside Touring Car

Write
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Booklet

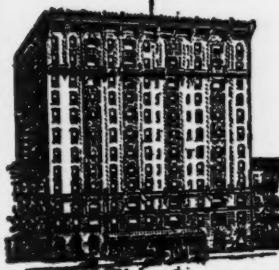
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W. H. VALIQUETTE
MANAGER
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KANTALEVER Emergency Spring Repairer

In your car. You may be 10 miles from nowhere and several hundred miles away from the supply of KANTALEVERS.



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\$3.50

HAVE NO REGRETS WHEN IT IS TOO LATE—Buy a KANTALEVER today. If your dealer does not carry it, request him to order a stock forthwith.

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COLE

The Standardized Car

The car that started the
stampede
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A Cole franchise is a valuable asset
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You can take a thousand miles of service out of a set of tires by driving them insufficiently inflated over ten miles of road.

Use the New Positive Lock Stop

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Simple, Accurate, Durable and Easily Read

For sale by Jobbers, Dealers, Garages, or

The Twitchell Gauge Co.

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United States Tires

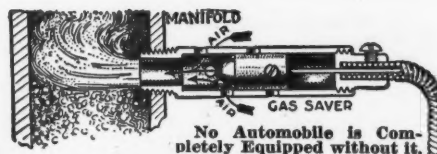
are good tires

They cut down tire bills



Henry Ford saw it first—and the others followed. The left-hand drive was built to meet American, not European, traffic conditions. It's just one reason why the Ford stands first in public opinion. Other reasons? One model, light weight, economy.

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The Stewart Piston Gasoline Saver

Saves up to 40% 20% Guaranteed
INCREASES POWER INCREASES SPEED
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Price \$6.50 Anywhere in the U. S. Ask
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Electric Self-Cranking Electrically Lighted Four Forward Speeds

The Herreshoff six was the first light six built and is today conceded the best example of skillful design in combining strength with reduced weight.

"Six-Forty" Touring Car and Roadster \$1850—7 Passenger \$1900
Model 4—30 Touring Car - \$1350
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Standardized

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AKRON, OHIO

This name on Automobile Tires and Rubber Accessories signifies inherent qualities of material and workmanship that insure the maximum of service at the minimum of expense. (878)

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Teetor "T" Head Motors, full floating rear axles, Brown-Lipe differential, Warner transmission, Eisemann Magneto, Carter Carburetor, handsome jewel bodies with ventilating windshield. Completely equipped with every convenience and comfort. Dynamo electric lighting and electric starter (Gray & Davis system), power tire pump. We have the greatest agency proposition in the United States. Write for our beautiful art book showing cars in detail.

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SEND to us today for advance folders which tell all about the big, new six-cylinder MARION. See the advertisements in all trade papers; wire us about our unusual dealers' contract for 1914.

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Light
Simple
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The Only ONE HAND Top

Can be raised or lowered with ONE HAND in less than ten seconds. Dealers and manufacturers invited to investigate our trade proposition.

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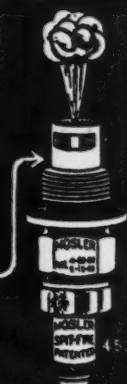
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are the BEST

FOR 13 YEARS HAVE BEEN LIKE THIS

INSIST ON OUR
GENUINE PLATINUM POINTED PLUGS

A. R. MOSLER & CO.
P. O. BOX "M", MT. VERNON, N.Y.



DON'T
THROW AWAY YOUR
OLD TIRES
COVER THEM WITH
STEEL
AND USE THEM
FOREVER

SKID
BLOWOUTS
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PUNCTURES
WEARING OFF
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Each section 2 in. wide. The hook to rims. Try two or three sections over any old blowout.

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KIMBALL TIRE CASE CO., 173 BDW., COUNCIL BLUFFS, IA.

Dorris

Built to Last

THE SILENT CAR

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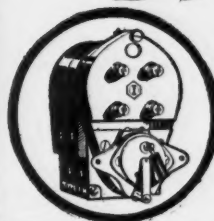
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We are offering a big, liberal proposition and unusual sales help to Agents on the

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We sell "through" the dealer and not "to" him. Write today.
DORRIS MOTOR CAR COMPANY St. Louis, Mo.

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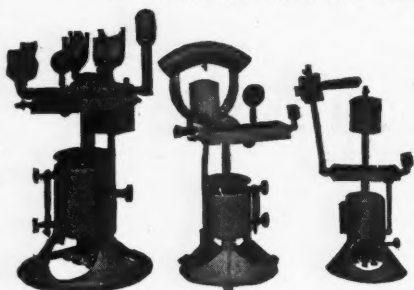
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The vulcanizing system that DOES NOT use air bags. SOLID PADS and HEAVY CLAMPS are the means through which pressure is generated.

Plants from \$25 to \$500

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Argo Electrics

have established the standard of electric car construction for all time to come.

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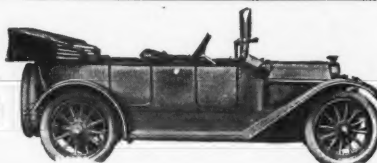
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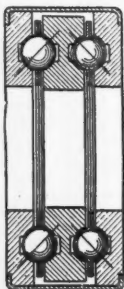
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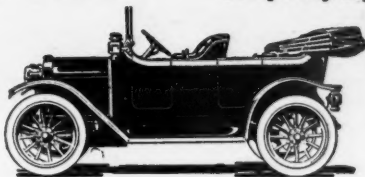
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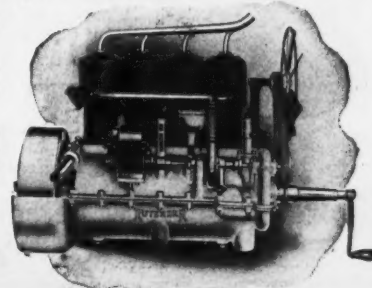
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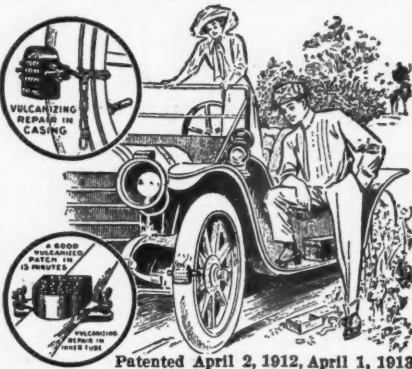
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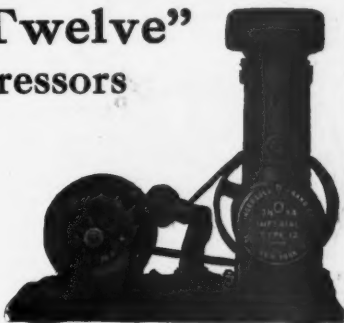
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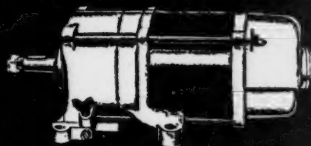
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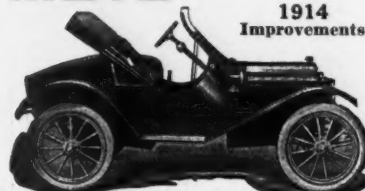
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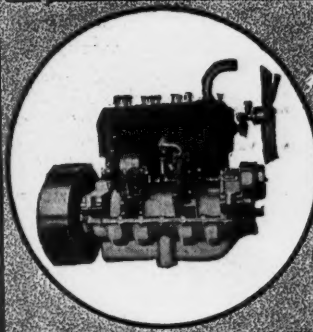
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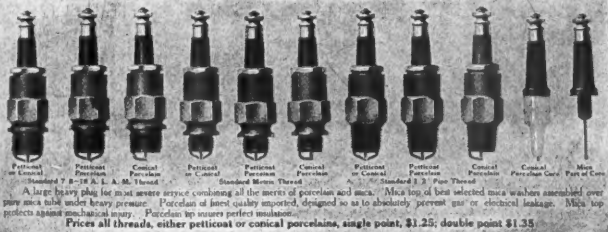
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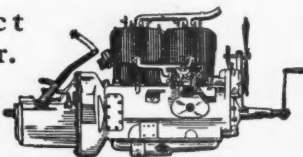
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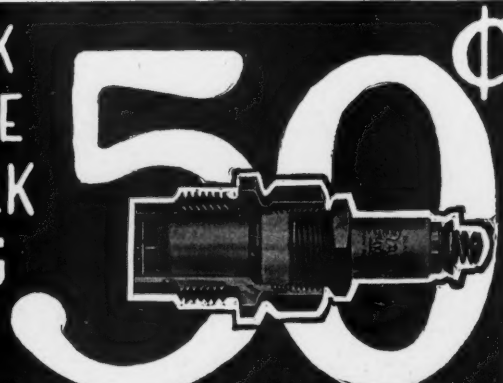
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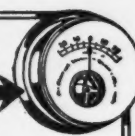
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automobiles cannot be used. Inquire E. S.
Haas, 3747 Hazel Ave., Cincinnati, Ohio. w

\$325.00 TAKES 1910 5-PASSENGER E. M. F.
Run less than 16,000 miles. Inquire
J. Dolister,
410 Main St., Racine Wis.

30-36 STEARNS SHAFT DRIVE 7-PAS-
senger touring car fully equipped, having
Continental demountable rims. I also have
a limousine body suitable for this car, which
is in excellent condition. Either or both of
the above will be sold very cheap. Address
G. M. Dias, 101 Main St., Johnstown, Pa.

"30-60" 5 PASSENGER STEARNS, JUST
overhauled and repainted, new tires, de-
mountable rims, with new extra tires. This
is a snap for some one wishing a high-pow-
ered car at a bargain. Condon, 2635 Wabash
Ave., Chicago.

1913 DETROITER TOURING DEMONSTRAT-
or \$500; demountable rims, new tires,
2,550 mileage; like new; never any trouble;
a bargain. Address Box 105, East Liver-
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1913 MIDLAND 6-CYLINDER 7-PASSEN-
ger touring car, fully equipped, including
Gray & Davis starting and lighting system,
seat covers, 2 extra tires and rims, 4 extra
tubes, etc. Run 4,000 miles. This car has
all standard parts and in A-1 condition.
Cost \$2,600; cheap for cash. M. Kaiser, 4561
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Parts and Accessories FOR SALE

ACCESSORY CATALOG MAILED ON RE-
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supply tops, shields, etc., for your cars. Lower
prices, all goods. Write us. Westchester Ac-
cessories Co., 1777 Broadway, N. Y. City.

ACME REPAIR PARTS
We carry a complete stock of parts for all
types of Acme cars. Can ship promptly.
Adam E. Arnold, 212 S. 11th St., Reading, Pa.

ARE YOU WISE OR OTHERWISE?

Who would not convert their 30 H. P. to a
fifty? Mr. Owner, your car is a loafer. Per-
haps she can go some. Let her go some
more. Speed her up with a J. & B. auxiliary
air valve. It is a revelation. No couplings,
no half measures. Will effect utmost pos-
sible fuel economy, nothing haphazard. Ab-
solutely automatic, operating all the time.

MEASURE GALLONS BY MILES.
Send \$3.75 and get wisdom without regrets.
Your satisfaction or money refunded. Write
Jones & Buckoke, Germania Auto Repair,
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ATTENTION BUYERS, JOBBERS AND DEALERS.

We are over-stocked. Double locks, re-
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Wire at our expense.

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ATTENTION—HENRY OWNERS

Having purchased the repair business of
the Henry Motor Co., we are prepared to fill
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Muskegon Automobile Co.,
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A WHITE STEAMER, GENERATOR AND
burner, almost new. Will sell cheap. Ad-
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AUTO BODIES, WINDSHIELDS, WHEELS.
250 new panel top delivery bodies, some
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\$28 to \$45. Folding plate glass windshields,
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rubber tires, only \$12 each. Benedict Co.,
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Repair and service parts for many cars.
We own all patterns and parts in stock for
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All Types and sizes.
We also repair or exchange all makes of
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Viso spark plugs; a glance shows missing
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BEARINGS—TIMKEN, HESS-BRIGHT, S. R. B., R. I. V. and other makes, 60 to 80 % discount. Most all sizes. Tell us size you want or send for our complete list.
AUTOMOBILE APPLIANCE CO.,
1714 S. Michigan Ave., Chicago, Ill.

BERGDOLL REPAIR PARTS.
The repair business of the Bergdoll cars, together with all drawings, jigs, patterns, etc., has been purchased by us. We have a complete stock of repair parts for all models on hand and orders for parts for Bergdoll cars should be placed with us direct to save time.
Louis J. Bergdoll Motor Co.,
124 N. 3rd St., Philadelphia.

BETTER LIGHT FOR 1-5 COST OF ELECTRICITY. Suitable for home or Store. Easily installed, no experience necessary, big demand. Write for **FREE** catalogue. **Doud Lighting Co.,** 175-F N. Sangamon, Chicago. g

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80 CENTS ON THE DOLLAR.

All sizes; black, brass or nickel; straight or zig-zag. French plate glass. Give size, style and finish desired.

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Made for Flanders "20" touring cars. Made of finest mohair; complete with irons, side and storm curtains. Can be fitted to **FORD, FLANDERS "20"** and **BUICK "10"** touring cars. Price \$11.85.

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COMPLETE "VULCAN PROCESS" of oxy-acetylene welding plants from \$175 for the blacksmith and garage plant up to largest made. Torchlight weight. No backfiring in ordinary work. Write today for our booklet on welding.
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E.M.F., Flanders, Buick, Regal, etc. Complete outfit with brass lock open pedal, \$1.50
Lincoln Machine Shop, Lincoln, Ill.

CYCLE CAR PARTS.

Pressed steel frames.....	Each	\$ 3.00
Half elliptic springs.....	Each	1.00
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Front axles.....	Each	12.00
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Rear sprockets, 64-tooth, 3/4" pitch.		
Each.....		2.00
Four-cylinder air-cooled motors.	Each	70.00
Two-cylinder opposed air-cooled motors.....	Each	40.00
Spring clips.....	Each	.10
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Side steering devices.....	Each	2.00
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GET OUR BARGAIN SHEET.

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DOES YOUR MOHAIR AND CANVAS TOP leak? Coleman's Waterproof Filler will make it rainproof. It will not stiffen or change the color. **Virginia Waterproofing Corp.,** Arcade Bldg., Norfolk, Va.

DRAGON REPAIR PARTS.
We manufacture and keep on hand all repair parts for the Dragon cars. We make a specialty of repairing this machine. **Philadelphia Machine Works, 67 Laurel St., Philadelphia, Pa.**

FORD CAR WIRE WHEELS.

Demountable wire wheels interchangeable all around, built especially for Ford cars. Five wheels to a set, enabling you to carry spare wheel with inflated tire, and make quick change.
THE F. & H. WIRE WHEEL CO.,
Columbus, Ohio.

FORD FAN BELTS, WOVEN COTTON AND silk; outlasts six regular belts. Postpaid, 60c. Dealers, write. **Angier's, Streator, Ill.**

FORD OWNERS—WE CAN MAKE YOUR car the easiest rider made with light or heavy load; no jolt, no jars, no upthrow. Write us. **Thomas Auxiliary Spring Co., Canisteo, N. Y.**

FORD, HUPP AND MAXWELL.
Muffler cut-out, machined ready to attach, including lock open pedal string and cables. \$1.35. **Lincoln Machine Shop, Lincoln, Ill. c**

FORD LIGHTING OUTFITS, \$5.50.
Includes parabolic reflectors, tungsten bulbs, wiring switch and free delivery. **Truscott Auto Supply Co., St. Joseph, Mich.**

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You will save trouble and money by installing our timer elevating device.
Ford Parts Specialty Co.,
1211 Main St., Richmond, Ind.

FORD OWNERS—OUR SPARE DEMOUNTABLE wheel cures tire trouble on road. Doctors, attention. Write **Angier's, Streator, Ill.**

FORE-DOOR BODIES, SIX AND SEVEN passenger; painted, not upholstered. Price, \$25.00.

AUTOMOBILE APPLIANCE CO.,
1714 S. Michigan Ave., Chicago, Ill.

FORE DOORS

We are prepared to make prompt shipment from stock and guarantee the doors to fit or money returned.
F. E. LORTZ CO.,
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Enter your order with us at once and take advantage of the following bargains while they last.

Ford Lighting Outfits.....	\$ 5.50
Clamp On Ford Bumpers.....	4.00
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Ford Oil Gauges.....	.35
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Tires 30" x 3 1/2", New.....	9.75
Tires 30" x 3 1/2", New.....	14.00

Write for list on other bargains. Terms, cash with order. Money back if not satisfied.
AUTOMOBILE SUPPLY & MACHINE CO.,
50 Rowland Bldg., Detroit, Mich.

FORD T. OWNERS.
Foot throttle or accelerators, \$1.50. **Lincoln Machine Shop, Lincoln, Ill. c**

FORE-DOORS AT CUT PRICES.

Mr. Auto Owner and Dealer: If your car is without fore-doors, write today for bargain prices; to reduce stock.

DEPT. D., AUTO SPECIALTY MFG. CO.,
326-30 E. Market St.,
Indianapolis, Ind.

FOR SALE.

36-42 H. P. "L" Head Motors, 4 1/2 x 5 (Continental type), with cone clutch.	\$250.00
Brown and Lipe sub-frame transmission, three speeds forward and one reverse, with shifting quadrants and lever "H" shift.....	50.00
Cone clutches with joint and cross and spring.....	12.50
18" hand wheel worm and gear steering gears (Gemmer type).....	12.50
Sheldon front and rear axles, shaft drive for car up to 30 H. P. with artillery wheels and demountable rims.....	82.50
A. O. Smith steel frames for 110-inch wheel base.....	10.00
Driggs-Seabury heat treated steel frames for 121-inch wheel base with kick up for three-quarter elliptic springs with all fittings for springs front and rear and standard-size sub frame.....	15.00
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Radiators with bonnet ledge for cars up to 30 H. P.....	11.00

Apply to **G. J. G. Motor Car Company,** White Plains, N. Y.

FOR SALE — TAXICAB BODIES, 5 months' service. Refinished. Original price, \$600. My price, \$200. **E. B. Collins Motor Co., Danville, Ill.**

FOR SALE—CINO RACING MOTOR, complete with double spark Remy racing magneto, \$175.00. Model N Ford engine and transmission, \$75.00. Three speed Brown Lipe trans. selective type, \$40.00. Double chain drive Apperson transmission, \$40. 50 H. P. Pope Toledo engine, \$75. 24 H. P. Pope engine, \$50. Pope Toledo parts for sale. **Auto-Salvage Co., 1436 Wabash Ave., Chicago.**

HAYNES MODEL W—2ND HAND PARTS —Practically complete car in parts as wanted at 25% value. Includes magneto. No tires or crankshaft. Good condition. **Farm Mutual Tel. Co., Grimes, Ia.**

"JIFFY" SIDE CURTAINS FOR FORD cars. Everything complete ready to attach to bows. Touring \$15; Roadster \$12.50. Price-list curtains for all cars on request. **HERCULES RUBBER CO.,** "Jiffy Curtain Division," No. 2 Hudson St., New York.

LION REPAIR PARTS.
We have on hand a complete stock of repair parts for all models of Lion Cars. **Lion Motor Parts Co.,** 124 N. 3rd St., Philadelphia, Pa.

MAGNETOS: WE HAVE 2,000 MODEL X Splitdorf Magnetos, new. Price, without coil, \$17.50 each; with coil, \$25.00 each. The regular price of these is \$75.00. We also have other makes of magnetos at cut prices—in fact, everything for the automobile. Send for **"OUR PRICE WRECKER"** —the greatest money saver in the world. **TIMES SQUARE AUTO CO.,** 1210 Michigan Blvd., Chicago, Ill. S. W. Cor. 56th St. & Broadway, N. Y. City

MAKE CASH OFFER FOR O. B. PORTABLE AIR COMPRESSOR. Practically new, suitable private or small public garage. Bids kept open one month. Any bid may be rejected. Address Box D 512, c/o Motor Age. h

MORA REPAIR PARTS.
We purchased the repair business of the Mora Company and have in stock repair parts for all models of Mora cars. **Philadelphia Machine Works,** 67 Laurel St., Philadelphia, Pa.

MR. (FORD) OWNER AND GARAGE MAN, The Townsan Valve Adjuster has a cushion for your valve-stems. Takes away the click, absolutely silencing the valves. No screws or burrs to work loose. Saves putting in new push-rods and valve-stems. They never wear out. Price \$1.50 by mail. Ask your jobber, or address **Townsan Auto Specialty Co., Mitchell, S. D.**

PARTS FOR CYCLE CAR.
Light 14 h. p. opposed air-cooled motor with timer, coil, oiler and carburetor, shop-worn but in perfect condition, \$60.00. New planetary shaft drive transmission, \$18.00. Light shaft drive jack shaft and differential, \$15.00. Regal steering gear, \$7.00. **E. E. Bush, 311 6th St., Parkersburg, W. Va.**

PREPARE FOR WINTER.
You will want a Hand Warmer to keep you comfortable and warm. We have a perfect Hand Warmer. They simply lace on your steering rim. Do not mar the rim; easy to put on or take off. Fit on any rim or car. They are comfortable and neat looking. They use very little current. Operate on current from the Ford magneto storage battery or lighting system. Sold on the money-back guarantee. See your dealer or write us direct.
Motorist Warm Grip Co., Marshall, Texas.

RADIATOR COVERS—WE ARE PREPARED to make prompt shipment. Full stock to fit all cars, \$1.40 to \$4.50. **Allen S. Sinsheimer, 1505 Michigan Ave., Chicago.**

RADIATOR COVERS FOR ALL CARS.
Every car should have a radiator cover in cold weather.
Write for prices.
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RADIATORS, 40 TO 60 HORSEPOWER, \$22.
Get our list of bargains.
AUTOMOBILE APPLIANCE CO., 1714 S. Michigan Ave., Chicago, Ill.

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KASTNER TIRE AND RIM CO., 2112 Michigan Ave., Chicago, Ill.

RADIATORS.

Every radiator guaranteed absolutely new, not a reconstructed one.

In stock for immediate shipment.

Ford Model "T".....	\$18.00
Buick 10-14.....	27.50
Buick F-16-17-19-26-27-28.....	35.00
Hudson 20.....	33.00
Chalmers F-40.....	30.00
Hupp 32.....	25.00
E-M-F 30.....	30.00
Anhut.....	15.00
Northern C.....	32.00
Wayne 30.....	35.00
Special 40 H. P.....	15.00

5% discount allowed for cash with order, otherwise one-third cash with order, balance C. O. D.

AUTOPARTS MANUFACTURING COMPANY

453 Trombly Avenue, Detroit, Mich.

RADIATORS—NEW GUARANTEED GOODS

Ford, Model T.....	\$16
Buick, Model 10.....	22
Buick, Model F.....	25
Chalmers-Detroit.....	20
Everett.....	20
Stoddard-Dayton.....	25

Any other make required at equally low prices.

The Times Square Automobile Co.,
1210-1212 Michigan Ave., Chicago.

REAL BARGAINS.

Garage measuring gasoline pump with two-barrel tank.....	\$50.00
36x4 Dunlop tires, seconds.....	Each 10.00
34x4 Wrapped tread tires, seconds.....	Each 16.00
16" Corrugated rubber rimmed steering wheels.....	Each 2.50
18" Corrugated steering wheels.....	Each 3.00
Selective sliding gear transmission, 50 h. p.....	65.00
Two-cylinder opposed Type H air-cooled motor, 4 1/2 x 4.....	65.00
Four-cylinder Premier motor, air-cooled, 20 h. p.....	50.00
Four-cylinder Franklin air-cooled motor.....	70.00
Four-cylinder Continental motor, 4 1/2" bore, 4 1/2" stroke, slightly used.....	90.00
Two-cylinder opposed Davis motor, 5 1/4" bore, 4 1/2" stroke.....	80.00

CUT PRICE AUTO SUPPLY CO.,
438 Rush St.,
CHICAGO, ILL.

"SAVE YOUR GASOLINE."

We have 150 Rayfield carburetors, regular \$20.00 kind. Our price, \$8.20 while they last
PURITAN MACHINE CO.,
415 Lafayette Blvd., Detroit, Mich.

SCHEBLER MODEL "L" CARBURETORS,
new, 1 1/2-Inch, \$8.00 each. Order early.
Kent Motor Car Co., Kenosha, Wis.

SHINAUTO—THE GREAT PRESERVER.

Keeps auto like new without washing. Prevents cracking and checking of varnish. Makes old cars like new. Guaranteed. Saves paint bills. Trial can, 50c by mail. Enough for two months' treatment.

SHINAUTO MFG. CO., INC.,
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SILVER PLATING WITH U-KAN-PLATE
Polish. Small capital; profitable work.
A. R. JUSTICE CO.,
619 Chestnut St. Philadelphia, Pa.

START YOUR CAR THE COLDEST MORNING with a single cranking. For 50 cents I will send you sketch of a little device, for any car, I have used on my Ford the past three winters with absolute success. Can be made at your local shop for \$1.00. No priming, no cussing, no sweating. She will run on the first spin, or money back.

D. H. Livingston, Cedar Rapids, Ia.

SPECIAL JOB.

One set Randolph four-ton truck wheels with steel rims and Timken hubs; face of felloe, 5 1/4"; diameter of wheel, 30". 2 1/2" spokes. Per set, including hubs.....	\$ 30.00
Brown-Lipe selective sliding gear transmission, 40 h. p., with multiple disc clutch, suitable for unit power plant.....	100.00
Two-cylinder opposed Columbia motor, second-hand.....	60.00
2x37 Swinehart solid rubber tires. Each.....	5.00

AUTO PARTS CO.,
513-31 Jackson Blvd.,
CHICAGO.

STOP USING A SHADE OR PAINTING the glass of your headlights. Use a DIM-A-LIGHT. Either a bright or dim light by simply turning switch. \$3.50 complete. Pellets Magneto Exchange, 1463 Michigan Ave., Chicago, Ill.

THE REAR LIGHT ALARM

is one of the most important inventions in the history of motoring. It is a device which audibly indicates when the rear light is out. The cause may be a broken bulb or filament, faulty connection or broken wire; any of which causes the

REAR LIGHT ALARM

to instantly sound. One fine saved will pay for it; lives may be saved by its use. Sent from the factory complete with a length of wire for connecting and full directions for installation; \$5.00 postpaid.

THE GUARANTEED SPECIALTIES CO.,
NEWARK, N. J.

TOURING, ROADSTER, RACING BODIES. Seats, special and stock sizes. Radiators, hoods, tanks and fenders for any car. Get our prices.

Auto Sheet Metal Works,
1534 Michigan Ave., Chicago.

TOPS BUILT, RECOVERED AND REPAIRED. Also Top Covers, Radiator Covers, Luggage Cases, Celluloid, etc. C. G. Meyer & Son, Tiffin, Ohio.

TRUFFAULT-HARTFORD SHOCK ABSORBERS; \$45.00 kind; \$20.00 set of four.
PURITAN MACHINE CO.,
417 Lafayette Blvd., Detroit, Mich.

UNION OXY CARBIDE CO.

Manufacturers of Portable (weight 40 lbs.) and stationary welding, cutting or lighting plants; supplies of all kinds. Agents wanted. Fulton & Enfield Sts., Brooklyn, N. Y.

WE MAKE FORD RACING TYPE BODIES in several models for immediate delivery.
AUTO SHEET METAL WORKS,
1532 Michigan Ave., Chicago, Ill.

WE NOW HAVE BUT A FEW 30-35 AND 35-40 H. P. motors ready for shipment. Complete with magneto, coil and clutch. F. E. Alford, Goshen, Ind.

WESTON MOTT HIGH GRADE REAR axles, \$45.00. Other bargains, too.
PURITAN MACHINE CO.,
413 Lafayette Blvd., Detroit, Mich.

WHITE STEAMER PARTS—ONE MODEL "M" engine complete; one Model "O" engine complete, generators, burners, axles, wheels, springs, and numerous other parts for any model cheap. Also one fine seven-passenger straight line touring body cheap. One fine 20-H. P. White Steamer, \$250. Address Box D 540, c/o Motor Age. w

2,000 GALLON GASOLINE SECOND HAND storage tank, 3/16" boiler plate, painted tested and guaranteed; 14" screw top with pressure blow off. Will sell cheap. Martindale & Millikan, Franklin, Ind.

50 NEW PRESSED STEEL FRAMES 163" long, 34" wide. Each \$10.00. Send for sketch.
Lucas & Son, Bridgeport, Conn.

\$50.00 AIR COMPRESSORS, \$18.00; FORD lighting outfits, \$2.90; Coupe bodies, \$65.00; Clamp on bumpers, \$2.95; Ford master vibrators, \$5.50, 6-80 storage batteries, \$9.50; Electric horns, \$2.95. Fred Allen Auto Supply Co., 1610 Michigan Ave., Chicago, Ill.

Wearing Apparel

FUR LINED OVERCOATS AT ONE-fourth value. Manufacturers' samples. Gentlemen's imported black broadcloth overcoats, lined with finest Australian mink, large handsome Persian lamb collar. All sizes. Retail value \$120. While they last will be sacrificed for \$35 each. First come, first served. You take no risk. Examine and try on before paying. Write today, stating size, enclosing express charges only, and coat will be sent at once. E. Roberts, Room 7, 160 West 119th St., New York.

Cars Wanted

FIFTY CARS WANTED FOR CASH.

Have customers waiting; if you want to sell your car quick, consign it to us; no charge whatever; we get our profits over your net figure; it is your privilege to remove car at any time without notice; will send for your car free within 200 miles.

American Used Motor Car Co.,

Brooklyn, N. Y.

500 Bergen Street. Near Flatbush Ave.

PATENT ON SPRING TIRE FOR NEW light touring car of good make. Am not able to finance the proposition. Chas. Goss, Robert Lee, Texas.

WANTED—CHEAP FORD OR FLANDERS auto.

Wolke Cycle Co.,
Louisville, Ky.

Parts and Accessories
WANTED

CRANK-CASE—IN GOOD CONDITION FOR Cameron; 24 H. P. motor.
Guy D. Primam,
Athens, Ill.

For Sale or Exchange

SEVERAL FIRST-CLASS MOTORCYCLES for sale or trade for automobiles.
Wolke Cycle Co.,
Louisville, Ky.

Situations Wanted

A LICENSED A. A. A. RACING DRIVER wishes to sign up with private owner or factory for 1914 races, or take the part of chauffeur this winter for private party. Address Box D 521, c/o Motor Age. w

A SUCCESSFUL SALESMAN WHO HAS secured connection with half million concerns as salesmanager, desires position with accessory manufacturer. Knows personally the car manufacturers and jobbers throughout country. Box D 541, c/o Motor Age. c

CHALMERS DEALERS ATTENTION!

Service man and foreman of large repair shop with Chalmers dealer open for engagement. Sober, reliable and first-class mechanic. Wide experience with other high-grade cars. Desires position that will be permanent, and where faithful and efficient service will be appreciated. Address Box D 501, c/o Motor Age.

FORD REPAIR MAN AND DEMONSTRATOR desires change; steady job; working knowledge of all cars, understands Delco System; married, temperate, industrious. Box D 516, c/o Motor Age. o

GERMAN TESTING ENGINEER,

Especially for cyclecars, arrives in New York the beginning of November. Long years' practice and technical. High-school student, excellent, licensed racing-driver, wants position as assistant of testing engineer. F. C. Volkhart, Gen'l Del., New York.

POSITION WANTED AS GARAGE MAN—ager and assistant salesman. Desires position that will be permanent with good pay. Am at present employed in similar position. Rest of references. For particulars address Box D 539, c/o Motor Age.

POSITION WANTED—MANAGER FIRST class garage or foreman first class repair shop. Eight years' experience; expert mechanic; reliable; sober. Only solid firms answer. For further particulars address R. J. Marquard, 405 No. 6th St., Springfield, Ill.

SUPERINTENDENT OF SERVICE DEPT.

Who has recently severed his connections with one of the largest Automobile Mfg. Branch Houses in New York, would like to connect with another Manufacturer in a similar capacity. Knows the trade thoroughly in New York, Long Island, Connecticut and New Jersey, as result of 13 years of experience, and can bring trade. Has been influential in the sale of many cars in territory mentioned. Any reliable house desiring services of such a man, address Box D 549, c/o Motor Age. s

Help Wanted

GOVERNMENT JOBS FOR MEN AND women; \$65 to \$150 month. Common education sufficient. Thousands of appointments every year. Write for free book of positions available. Franklin Institute, Dept. W 71, Rochester, N. Y.

HIGH GRADE AUTOMOBILE MEN—AP- plicants and employers write us concerning available positions in every branch of the industry. Toledo Engineering Agency, Toledo, O.

INSTRUCTOR WANTED

FOR AUTOMOBILE SCHOOL.

Must have had at least one year in the management of an auto school, and also years of experience in the repair business. Must also be a capable man on ignition and lighting systems.

Give references, also state salary wanted. Unless you are a first-class man do not answer for we will look up your record.

International Auto School (Incorporated), 733 East Houston St., San Antonio, Texas.

REPRESENTATIVE FOR AUTOMOBILE publication for New York City and vicinity. Must be first-class solicitor and understand automobile game. \$150 to \$300. Communicate with Mr. Harrison, The Engineering Agency, 1662 Monadnock Bldg., Chicago, Ill.

WANTED—NEAT APPEARING AUTO ME- chanics, with good references, in all small towns, to make installations of automobile devices for us. Address Halliwell Co., 408 West Pico St., Los Angeles, Cal.

WANTED—LIVE RESPONSIBLE AGENTS who mean business, to sell the only filter on the market that will separate water from gasoline and similar oils. Something every automobile owner ought to have. Address H. H. B., P. O. Box 52, Station A, Detroit, Mich.

WANTED—A YOUNG MAN TO REPRESENT an electric automobile manufacturer on the road. Must have attractive personality and furnish reference. Only high-class men need apply. Address Box D 544, c/o Motor Age. o

Wanted—Agents

WANTED — AGENTS TO SELL JIFFY Auto Curtains in unallotted territory. Address Hercules Rubber Co. (Jiffy Curtain Division), 2 Hudson St., New York.

WANTED—SUPPLY HOUSES, MANU- facturing agents and salesmen to sell the RUSS OXYGEN CARBON REMOVER. Write or wire today. F. W. Stewart, 1509 Michigan Ave., Chicago.

Agency Wanted

WANTED—BY A LARGE MINNEAPOLIS firm, Minnesota, North and South Dakota territory, for car selling between \$700 and \$850. Box D 543, c/o Motor Age. n

Business Opportunities

AUTOMOBILE DISTRIBUTING BUSINESS

For sale. Located in western Iowa. In a flourishing condition. Good reason for selling.

Box D 535, c/o Motor Age. r

FOR RENT—SECOND FLOOR OF GARAGE for machine shop; 50x125; without any posts; elevator, gas and electricity; on main thoroughfare of Gary, Ind. Write Dorman & Sykes, Gary, Ind.

FOR SALE—CYCLE CAR ENG. PAT- terns. Four cycle, single, double, opposed and three cylinder vertical air and water. G. M. Johnston, South Haven, Mich.

FOR SALE—GARAGE BUSINESS ESTAB- lished three years. Town of 10,000. Only one competitor. Keeps four repairmen busy. Price, \$4,000.00. Includes complete shop equipment, tools, air compressor, emery wheels, drill press, brazing outfit, traveling crane, gasoline and oil storage systems, two five-passenger touring cars, one 1913 model. Have good reason for selling. This is a fine chance to start right. Inquire Box D 584, c/o Motor Age, for particulars.

FOR SALE IN NORTHERN ILLINOIS—A fine auto and tire repair business in a good town with plenty of cars to work on. Will invoice about \$2,000, will sell for \$1,500. I have done \$6,000 worth of business in 6 months. Good reasons for selling. Write for particulars. Will sell machinery and tools separate if desired. Box 537, care Motor Age. f

FOR SALE — MACHINE SHOP AND garage in a good western city of 10,000 population. Ford agency in connection; large storing capacity. Reason selling, other business demands attention. Box D 546, c/o Motor Age. k

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31-3 1/2	10.45	3.25	36-4	15.75	4.70
32-3 1/2	10.60	3.40	35-4 1/2	19.00	4.80
34-3 1/2	10.95	3.60	36-4 1/2	19.50	5.50
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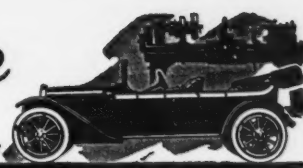
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32x3½	12.00	2.90	2.65
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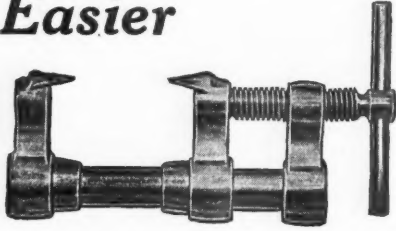
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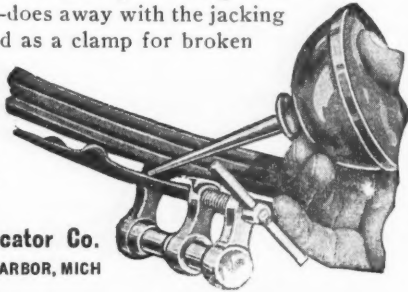
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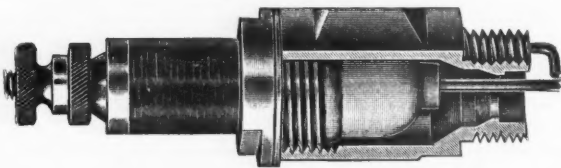
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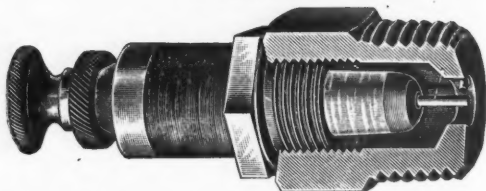
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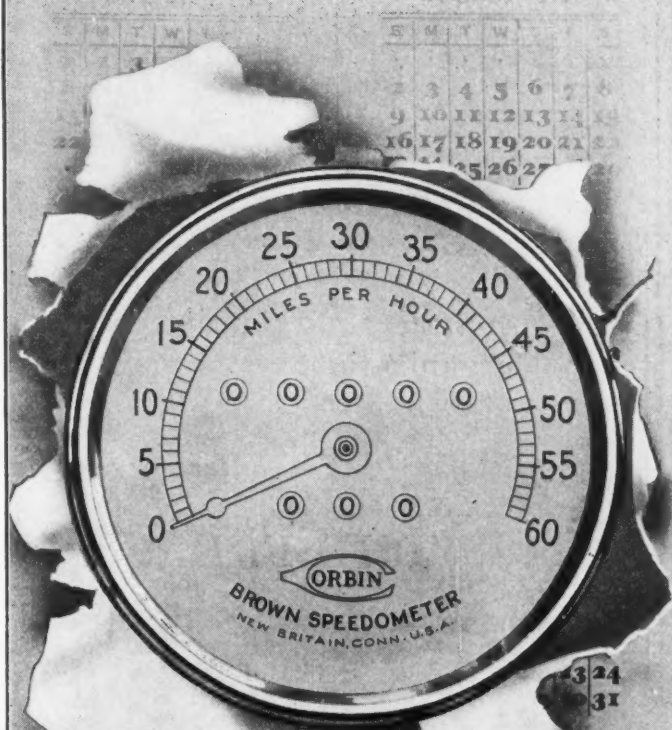
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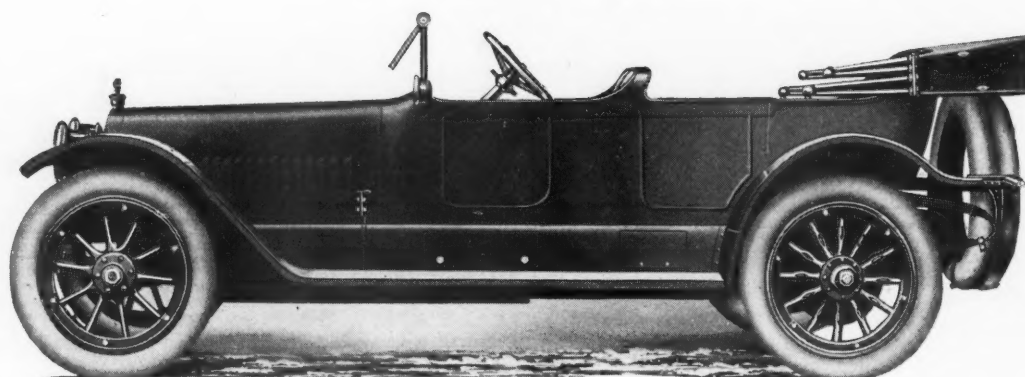
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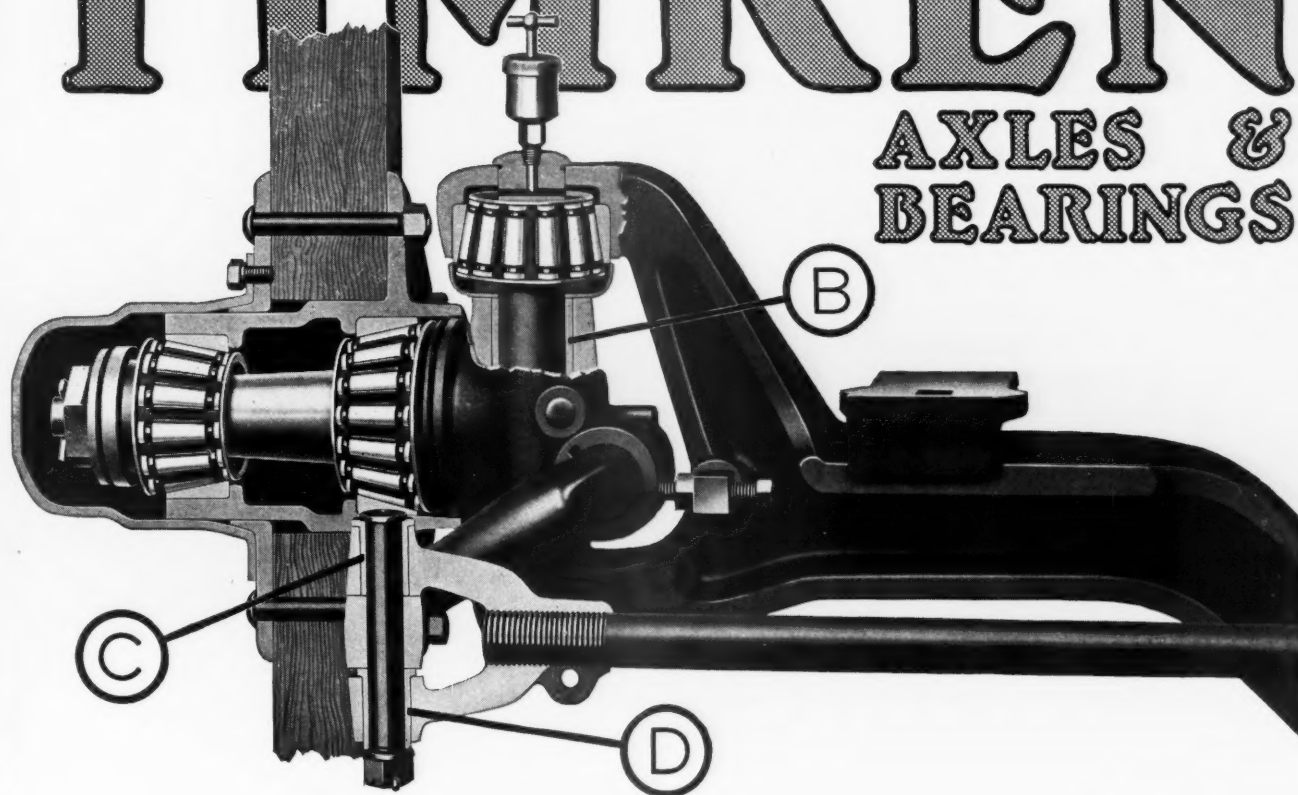


Stearns-Knight Six-Cylinder Six-Passenger Touring Car

This car is one of the new models added this year to make the Stearns-Knight line for 1914 even more complete than in previous years. The purchaser is allowed an exceptionally wide range of choice in body styles in either the four or six cylinder type—each attractive in its lines, superbly finished and luxuriously equipped.

TIMKEN

AXLES & BEARINGS



Axles That Never Wear Out

MOVING parts of axles, like moving parts of anything, will wear in time. There is no exception to this rule, but—

In the Timken-Detroit Front Axle the moving parts—every one of them—are either Timken Roller Bearings or hardened and ground steel bushings or pins.

These bearings, bushings and pins wear very slowly. Timken Bearings are adjustable to take up the slight wear and Timken-Detroit Bushings and Pins are easily replaceable when worn sufficiently.

So the axle may truly be said to never wear out.

Take the front axle spindle. No wear comes on it because nothing moves on it. Slight wear does come on the cones, cups and rollers of the two bearings. These are Timken Tapered Roller Bearings that offer greatest resistance to wear and are adjustable to offset the effects of wear when it comes.

Same thing is true of the steering knuckle pin. At the top, to sustain the great weight, is a Timken Bearing. Below, where pressure is less but where there is some motion, there's a hardened steel bushing. It is made of good steel, is heat-treated, hardened and ground to size so it wears very slowly.

And when it does wear can be replaced easily, quickly and cheaply. Because Timken Bushings are accurate to the thousandth part of an inch, they are interchangeable. A new one will fit without any tinkering.

Look at the bushing "B" in the picture. The pin is keyed into the steering knuckle in which

this bushing is pressed. There's no turning of the pin in bushing "B." Then why have a bushing at all?

To make a tight fit so there'll be no pound from the constant vibration. Not one little point like this is overlooked in Timken-Detroit design.

Note the bushings in the cross-rod yoke (C and D). Due to spread of yoke the pressure is kept low and when wear comes here it must come on hardened pin and bushings that are replaceable at low cost. They, too, are accurate and interchangeable.

Of course Timken-Detroit Axles are strong enough, and a spare, for the loads they are designed to carry. And for the emergencies of motor-truck and pleasure car service. They are standing up under thousands of commercial and pleasure cars made by the leading builders.

When every other part of those cars is worn out, new pins, new bushings, perhaps a new bearing here and there will fit them for another lifetime of service under another car.

A 52-page booklet, "The Anatomy of Automobile Axles," sent free, postpaid on request, tells the story of the axle in an interesting human way. Write for it



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